APRIL 20, 1957

electronics

business edition

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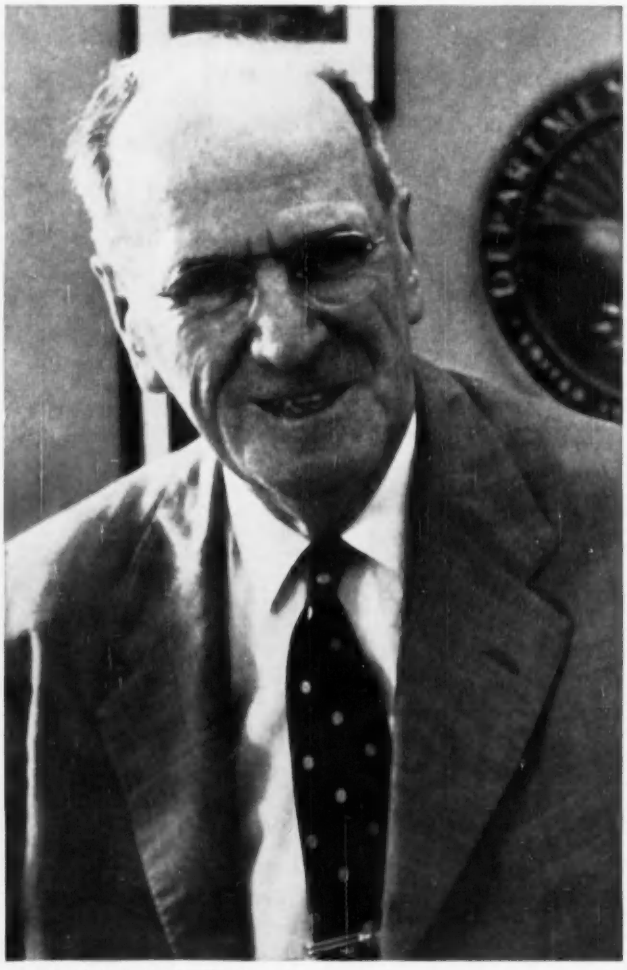

EX-WESTINGHOUSE v-p Newbury:
to ease technical manpower pinch, streamline R&D (p 13)

NEWS AT A GLANCE

NEW DEFENSE CHIEFS FAVOR ELECTRONICS

(page 13) . . . Tv setmakers find private-label sales smooth business bumps (15) . . . Los Angeles firms guide high-school students to engineering (17) . . . Market research takes some chance out of new-product launching (19) . . . Electronic equipment for earth satellite stress miniaturization, transistors (20) . . . Analog-to-digital converters spark growing market; boost speed, accuracy (24) . . . Manufacturers discover renewed shortwave-listener market (26) . . . Industry answers FCC call in new tv-allocations go-round (39) . . . Air Force's missile range fosters industry growth in Florida (41) . . .

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business edition

A McGraw-Hill Publication
Vol. 30, No. 48

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Industry Outlook

MANUFACTURERS of broadcast equipment sold $87 million worth of gear during 1956. Total sales may reach $100 million in 1957. Although there is no coming trend to equal rapid-post-freeze growth in tv, there are many bright spots:

- **Closed-circuit tv grossed $3 million in 1956. Industrial uses, apartment-house networks, local wired systems, like Bartlesville, Okla., piping new movies into subscribers' homes, will boost business.**

- **Toll tv, slated by FCC for further "limited" test might, if accepted, encourage a few new uhf starts. Home decoding equipment could become a big item.**

- **Compatible single-sideband may help a-m stations increase fidelity and service area. All 3,014 stations are possible buyers. Channel space saved could permit many more to get on air.**

- **Large market still remains in color studio equipment. Only about half of 513 stations are equipped for color. Less than ¼ for slide and film origination. A mere handful can now originate live programs.**

The broadcast equipment business is a long way from being merely a replacement market. Combination of replacement and new equipment sales means continuing high level of activity for years to come.

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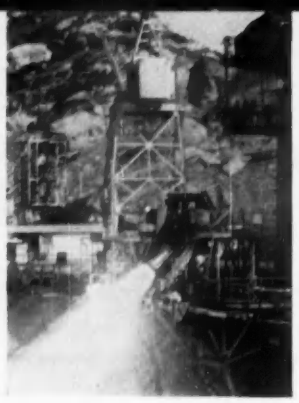


performance test

Brush Recording Systems at Rocketdyne, a Division of North American Aviation, Inc., directly record stress, acceleration, and acoustic values of rocket engines under test.

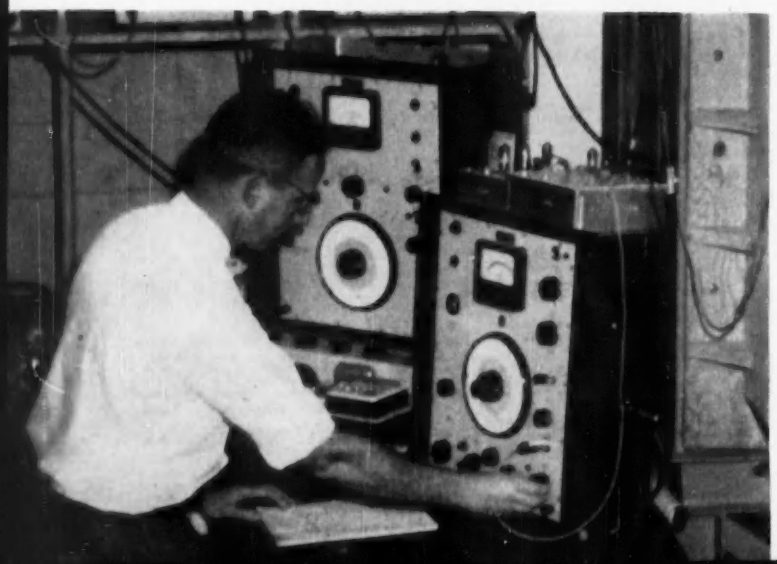
in all types of applications...

45,000 CHANNELS OF BRUSH OSCILLOGRAPHS IN SERVICE!

When selecting recording instrumentation for either military or industrial research and development, you want equipment that is proved by experience. Remember—there are more channels of Brush direct-writing oscillographs in use than all other makes combined.

This equipment offers the widest range of recording speeds available, to provide excellent readability for a wide range of signals. You have a choice of ink writing or electric writing, available in console, rack mounted or portable units.

The direct-writing frequency range, from d.c. to 100 cycles per second, covers the great majority of requirements for measurement of physical phenomena. Thus you can instantaneously record stress, strain, vibration, torque, force, and many electrical variables. Select *BRUSH* for equipment backed by unmatched experience.

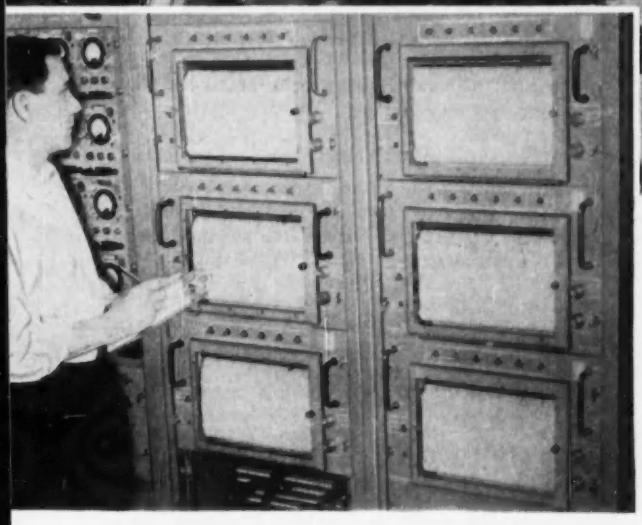


complete frequency spectrum analysis for noise tests

With a Brush-Bruel & Kjaer Spectrum Recorder, a complete frequency spectrum analysis can be performed in a matter of seconds. This instrumentation operates *automatically*—thus saves hours of engineering time. And it presents recorded data in one-third octave steps—a form in which information is most meaningful and useful to noise reduction programs.

Shown at left is an aircraft test setup measuring loss in acoustic transmission through fuselage wall panels. This is one of scores of complete systems for sound, noise, or vibration analysis using Brush-Bruel & Kjaer equipment.

Official photograph U.S. Navy



telemetering

Over 100 Brush units at the Naval Air Missile Test Station at Pt. Mugu directly record data telemetered from missiles such as the Regulus I. Instruments record an almost limitless variety of functions and conditions, including pitch, yaw, acceleration, pressure, strains, etc.

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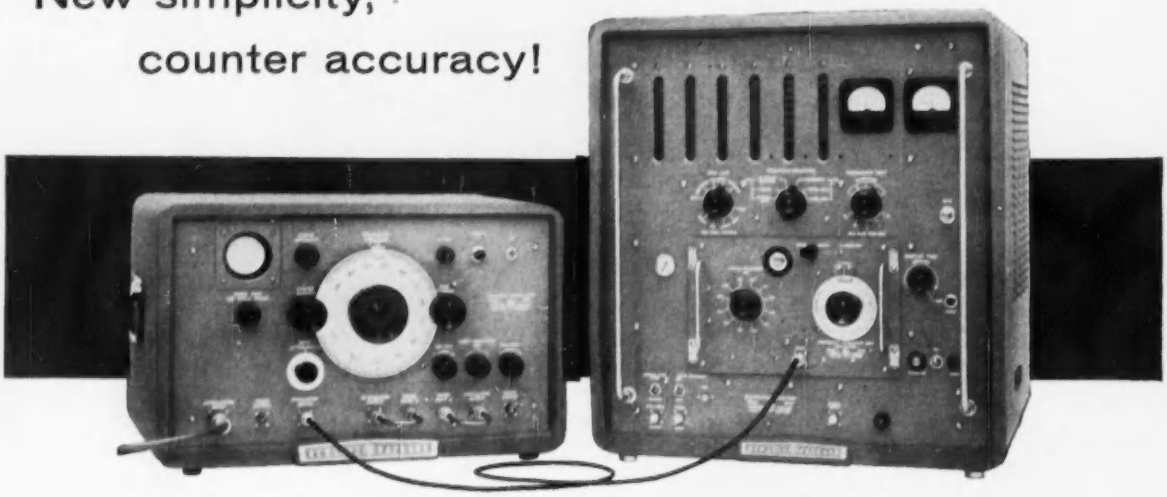

-hp- 540A Transfer Oscillator

-hp- 524B Electronic Counter

Measure frequency to 12 KMC on pulsed, AM, FM, CW and noisy circuits

Fast, convenient, simple set up

Just two *-hp-* instruments—Model 540A Transfer Oscillator and Model 524B Electronic Counter (with plug-ins) permit you to measure unknown frequency to 12 KMC with speed and accuracy.

Complex instrument arrangements and tedious trial-and-error work are eliminated. When approximate signal frequency is known, the 540A oscillator is merely tuned until one of its harmonics zero beats with the unknown. The multiplying factor is noted, and the 540A frequency measured precisely on the 524B Counter. The 524B reading, times the multiplying factor, is the unknown.

When the signal frequency is totally unknown, a simple calculation employing two or more harmonics determines the proper multiplying factor; the measurement is then made as before.

On clean CW signals accuracy is about 1/1,000,000; overall accuracy is better than 10 times that of the best microwave wavemeters.

For complete discussion and information, see your -hp- representative or write -hp- for Technical Data sheets and -hp- Journal, Volume 6, Number 12.

Many different uses

The unique 540A/524B combination is particularly useful for swift CW and AM frequency determination, measuring center frequency or deviation range on FM signals, measuring frequency on high noise circuits and making high-accuracy measurements on pulsed signals.

Features—Model 540A Transfer Oscillator

Oscillator Fundamental Frequency Range 100 to 220 MC. Harmonic Frequency Range to 12 KMC. Stability better than 0.002% change per minute after warmup. Output 2 v into 50 ohms. Attenuator range 20 to 80 db, into 50 ohms, low SWR. Amplifier 40 db variable gain, 1 v output. Self-contained oscilloscope 100 cps to 200 KC, vertical deflection sensitivity 5 mv rms/inch at mixer output. Prices: *-hp-* 540A Transfer Oscillator, $615.00; *-hp-* 524B Electronic Counter, $2,150.00; *-hp-* 525B Frequency Converter Unit, $250.00.

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Complete instrumentation for frequency measurement

ASE fosters growth firms

Lists 35 electronics shares

12 listed for two years

Minimum earnings not required

AMERICAN Stock Exchange listing is becoming increasingly popular with electronics industry members. General Transistor is one of the latest members of our industry to list its stock on the exchange. Equipment mounting manufacturer, Barry Controls went on the ASE board last month.

There are about three dozen manufacturers of electronic equipment listed on the ASE. Thirteen of these have been listed since 1955: Barry, General Transistor, American Electronics, Audio Devices, Oxford Electric, Litton Industries, Clary, EDO, Skiatron, Belock Instruments, El-Tronics, Nuclear Corp. of America and Servo Corp. of America.

Supporting this trend is ASE's policy of encouraging listing of securities by young and small as well as old and established companies.

Unlike the New York Stock Exchange, which looks for earnings of at least $1 million, the ASE has no minimum earning requirements.

Explains Martin J. Keena, vice president in charge of listing for the American exchange, "Although we require neither a minimum amount nor a long history of earnings, we ordinarily expect a company to have become profitable, to have qualified management, reasonable prospects for increased earnings and adequate working capital."

The ASE usually requires a minimum public distribution of 100,000 shares of stock among not less

SHARES and PRICES

INCREASING expenditures for missiles are having a marked effect on defense spending patterns. Congress is being asked to vote $2 billion for missiles in coming fiscal year.

Air Force plans to spend 35 percent of its procurement money on missiles in next fiscal year. Three years ago proportion was 10 percent. Army's proportion will rise to nearly 50 percent. Number of manufacturers of missiles, guidance systems and related equipment is steadily increasing. Not all of the publicly traded companies active in missile manufacture could be included in this analysis because of space requirements.

Missile Manufacturers	Recent Price	1956 Dividends	Percent Yield	Earned per Share 1956	Earned per Share 1955	Traded	1956 Price Range
ACF Industries	59⅜	4.00	6.7	2.77 (6 mos)	5.00	NYSE	63 – 76
Bell Aircraft	21½	1.25	5.8	2.21 (yr)	2.25	NYSE	20 – 27
Bendix Aviation	60	2.40[1]	4.0	5.04 (yr)[4]	5.66	NYSE	48½ – 64⅜
Boeing Airplane	46	1.00[2]	...[3]	4.82 (yr)	9.33	NYSE	45⅜ – 65⅜
Chance Vought Aircraft	42⅝	1.60	3.7	3.81 (yr)	4.41	NYSE	31⅜ – 45⅜
Douglas Aircraft	76½	4.00	5.1	8.96 (yr)[4]	7.65	NYSE	72½ – 95⅝
Dynamics Corp. of America	6⅝	0.40	6.0	0.28 (6 mos)	0.61	ASE	5⅝ – 8⅜
Eastman Kodak	84	2.65[1]	3.2	5.13 (yr)	4.66	NYSE	75¾ – 100¾
Fairchild Eng. & Airplane	10⅞	0.25	2.3	0.45 (9 mos)	1.41	NYSE	10½ – 15⅝
Firestone Tire & Rubber	87	2.60	3.0	7.43 (yr)[4]	6.81	NYSE	68 – 98
General Dynamics	58¼	2.40	4.1	4.13 (9 mos)	4.23	NYSE	45⅛ – 59⅝
General Electric	56¼	2.00	4.0	2.46 (yr)	2.42	NYSE	52¾ – 65½
Lockheed Aircraft	45¼	2.40[1]	5.3	3.83 (9 mos)	6.12	NYSE	43¼ – 58⅞
Martin (Glenn L.)	41	1.60[1]	3.9	2.71 (9 mos)	4.92	NYSE	31 – 45¼
Motorola	38½	1.50	3.9	4.12 (yr)	4.39	NYSE	37½ – 51¾
North American Aviation	29¾	1.60[2]	...	3.59 (yr)[4]	9.42	NYSE	38¾ – 49⅞
Northrop Aircraft	25⅜	1.60	6.3	3.28 (yr)[4]	7.89	NYSE	21¼ – 29⅛
Philco	15	0.80[1]	5.3	0.01 (yr)	2.13	NYSE	16 – 36½
Radio Corp. of America	33½	1.50	4.5	2.60 (yr)	3.16	NYSE	33⅞ – 50⅜
Raytheon	17⅛	....	...	0.45 (yr)[4]	1.72	NYSE	13 – 19½
Republic Aviation	28¼	2.00	7.1	5.00 (yr)[5]	10.10	NYSE	28⅜ – 43½
Ryan Aeronautical	32½	0.50	1.5	3.36 (yr)[4]	4.07	ASE	29⅞ – 37½
Sperry Rand	21¼	0.80	3.8	1.22 (9 mos)	1.80	NYSE	21¾ – 29⅛
Western Electric	93	3.60	3.9	5.74 (yr)	4.99	OTC	.....
Westinghouse Electric	54⅝	2.00	3.7	0.10 (yr)	2.46	NYSE	50⅞ – 65⅞

[1] plus stock dividend [2] annual rate [3] stock split in 1956 [4] fiscal [5] estimated

than five hundred public stockholders.

Recently listed General Transistor illustrates American Stock Exchange listing requirements. GT is a little more than two years old. For the first nine months of 1956 it reported earnings of $129,000. Of 283,966 common shares outstanding only 179,166 are owned by officers and directors.

Of particular interest at this time is the ASE position on the question of delisting. The New York Stock Exchange recently announced proposals to delist several companies because their earnings have fallen below its minimum standard.

Says McKeena on ASE's delisting policy: "We do not consider the fact that the earnings of one of our listed companies has fallen below a certain minimum as sufficient grounds for delisting."

Index sells electronics

STANDARD & POOR'S electronically computed index of 500 stocks may be significant to the electronics industry as well as Wall St. Hourly transmission of the index began March 4. It is carried to 1,150 brokerage offices.

Melpar of Boston working with Standard & Poor developed the code converter. It transforms printed information from the New York Stock Exchange ticker tape to six- and then to four-channel perforated tape. The four-channel tape is fed to a Burroughs Datatron computer.

DATA link reads tape

COMPUTER data on magnetic tape may be sent directly over experimental system reported by Bell Labs. Transistorized data subset small enough for a desk accepts reels of magnetic tape, transmits data over telephone lines to another subset.

System sends 1,000 words a minute; it could operate automatically during off-peak-traffic hours. Results suggest systems sending data speedily all over the U. S., even computers talking to other computers.

At the sending end a 1.2-kc oscillator is amplitude modulated by code signals; signals are amplified and parity checked. Switches are set for sending data after initial voice contact.

Automatic volume control at receiver evens out energy level of pulses. A detector converts these to d-c, magnetizing spots on a tape. Another circuit checks for errors introduced during transmission.

MERGERS, ACQUISITIONS and FINANCE

I-T-E Circuit Breaker sells $10 million of convertible subordinated debentures to reduce substantial increase in short-term bank loans. **Narda,** Mineola, N. Y., plans to acquire **Kama Instrument,** Mineola manufacturer of fine wire components. Kama will become a wholly owned subsidiary.

Siegler Corp. completes preliminary insurance financing of $1 million in additional long-term installment notes and $500,000 in subordinated convertible debentures. Proceeds will be added to working capital and used to finance increased production, particularly of Hallamore division's electronics products.

American Electronics, Los Angeles, offers 190,000 shares of $1 par common stock at $11 a share. Proceeds from sale of 130,000 shares will be used for corporate purposes. Balance of shares is presently outstanding and being sold for the account of three shareholders. About $350,000 of corporate proceeds will be used to reduce outstanding loans. Some $125,000 of receipts will be used to purchase test equipment for new testing laboratory.

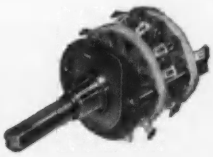
Vitro, New York, registers 178,646 shares of 50-cent par common with SEC. Stock will be offered to Vitro common stockholders at rate of one new share for each five held. Proceeds are for expansion and capital investment.

Universal Transistor Products, Westbury, N. Y., issues 150,000 shares of 10-cent par common stock at $2 a share. Proceeds are for machinery, equipment, expansion, inventory and working capital. Michael G. Kletz, Stanley Heller and Aetna Securities underwrite issue.

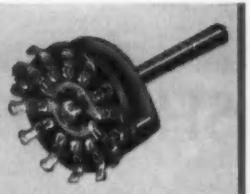
Stewart-Warner electronics division acquires facsimile business of **Allen D. Cardwell Manufacturing Corp.** of Plainville, Conn. All Cardwell's facsimile assets and license agreement with Hogan Laboratories were acquired through cash purchase.

Value Line investment survey says shipments of electronic components and systems under government contracts are increasing. Trend should persist even though total government expenditures on aircraft level off, survey says. Aircraft speeds and altitudes have reached point where man cannot master machine without automatic controls.

American Stock Exchange is studying feasibility of completely electronic quotations system. Exchange hopes to furnish instantly opening, high, low and last prices, current bid and offer and accumulated volume for every security traded on its floor. ASE president, Edward T. McCormick, is closely following project.



Type F: Miniature 12-position, 30-60° throw, can be mounted in 1-5/16" circle; phenolic, Mycalex or steatite.

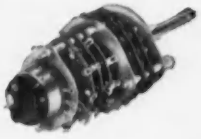


Type H: Standard 12-position; 1-7/8" diameter; 15-30-60° throw; phenolic, Mycalex or steatite.

Types J, K, N: 1-17/32" diameter; provides for flexibility of layout; interchangeable sections, phenolic or steatite.

Type L or DL: Using dual eyelet fastening; 18-position; mounts in 2-9/32" circle, phenolic, Mycalex.

Special Switches



Multiple Shafts combined to operate snap switches and potentiometers; many different section types.

Type MF: 24-position switch may be mounted in 2-5/16" circle; in phenolic insulation.

Series 20: Simple switch for tone controls, band switching, and talk-listen circuits.

For Printed Circuits: Special lug design for insertion into printed circuit boards.

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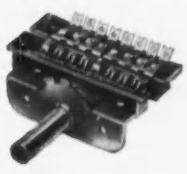
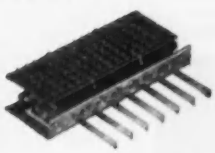
Type 160 Rotary Slider: 7/8" height allows shallow chassis; leads are readily accessible.

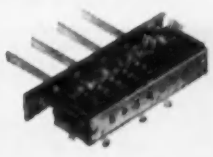


Type 185: New lever-operated version of the standard Oak rotary switches.

Type 130 Pushbutton: Available with from one to 24 buttons, 32 contacts each button.



Type 80 Pushbutton: Very adaptable. Used in communication equipment; economical for less complex applications.



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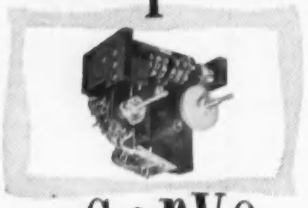

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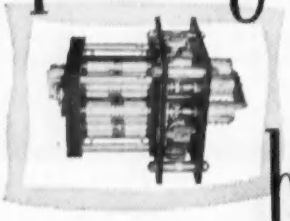

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WASHINGTON report

ARMY-AIR FORCE fight for control of intermediate-range ballistic missile is about to make headlines again. Immediate issue: Army court-martial of Col. John C. Nickerson, Jr., missile expert, to start May 15 at Redstone Arsenal.

Nickerson will be tried on charges of violating security regulations and perjury. He allegedly leaked secret details about IRBM in a sizzling critique of Defense Sec. Wilson's order restricting Army to missiles with range under 200 miles, assigning Air Force operational control over 1,500-mile IRBM.

Wilson's order was supposed to halt interservice bickering. But it left open whether Army's Jupiter or Air Force's Thor IRBM would get into production. Prime guidance contractor on Jupiter is Ford Instrument, on Thor, GM's AC Spark Plug division. Insiders have assumed Air Force Thor project would get the green light.

There have been reports and denials from Pentagon that Army's Jupiter project, on which $175 million has been spent in last two years, has been canceled. Wilson says even if Thor gets the nod, work on Jupiter will continue. For how long he won't say. Some of Jupiter's subsystems may go into Thor.

However, funds are earmarked for Jupiter only until July 1, 1957. One of Wilson's aides tells ELECTRONICS "We're trying to soften the blow on the Jupiter project." We might try to use some of Jupiter's guidance in Thor." Overriding factor is that two services have shaped development of their IRBM's around their own requirements and resources.

• Air Force is used to highly complex equipment; stress is on automatic systems—less manpower to operate, more to maintain.

• Army prefers a weapons system that's easier to maintain though it may need more muscle power to operate.

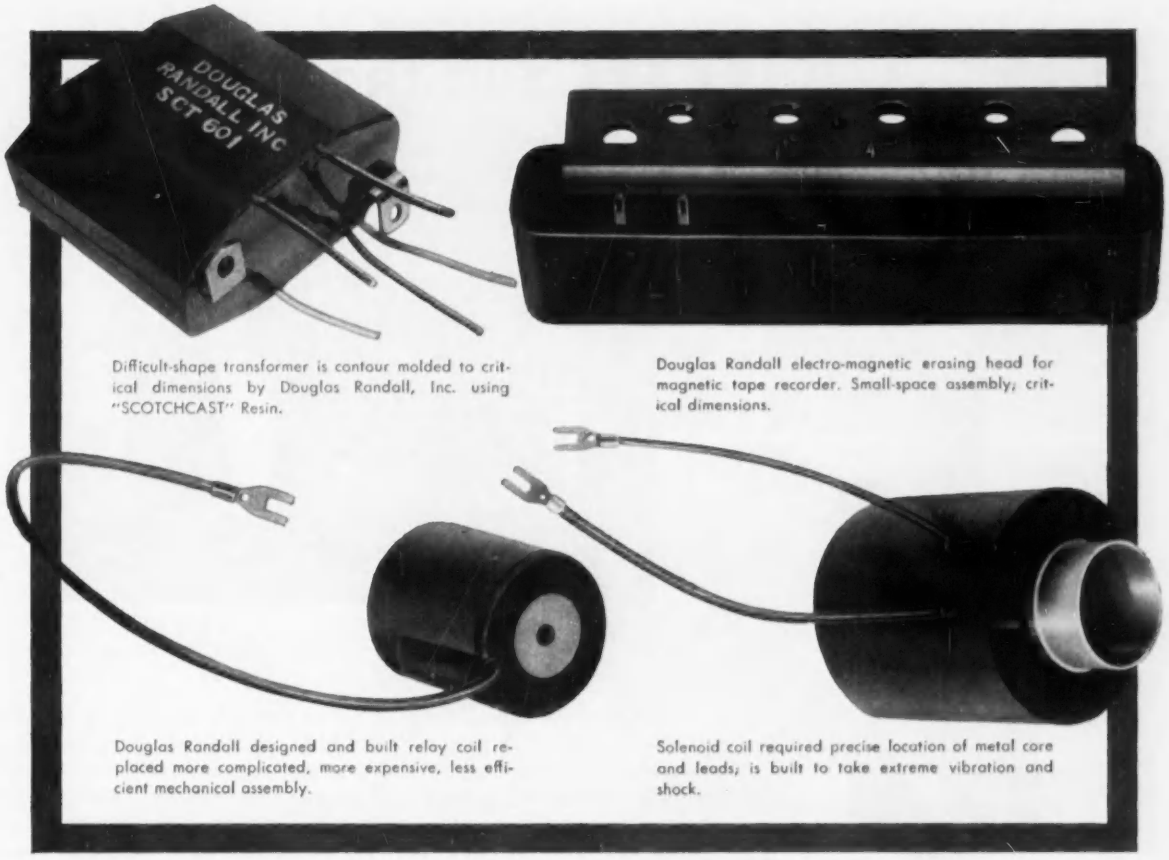
Designs for Thor and Jupiter reflect these differences. Since Air Force has been given clear-cut operational control, the production issue has been resolved—despite feuding and fussing which still goes on.

See more PAY-TV delay

Controversy over allowing pay-tv signal to be broadcast may mean more delay and stalling, even if regional testing works out. One question: will new bandwidth-saving schemes permit bringing pay-tv programs into homes on wire or low-cost cable?

Budget cutting drive has sidetracked any hope for pay boosts for electronic engineers and scientists working for the government—as recommended by Cordiner committee. Pay boost to keep needed technical men would be too expensive now.

FCC widens its look at cluttered radio spectrum. Determined to loosen space in 25-890 mc range, it announces study looking to relief in areas like Safety and Special Radio, Domestic Public Radio Services. In 25-890 mc spectrum some million transmitters now operate. Commission looks to more channel splitting, narrowing some services and shifting many others.



Difficult-shape transformer is contour molded to critical dimensions by Douglas Randall, Inc. using "SCOTCHCAST" Resin.

Douglas Randall electro-magnetic erasing head for magnetic tape recorder. Small-space assembly; critical dimensions.

Douglas Randall designed and built relay coil replaced more complicated, more expensive, less efficient mechanical assembly.

Solenoid coil required precise location of metal core and leads; is built to take extreme vibration and shock.

DOUGLAS RANDALL, Inc., solves these tough coil problems with SCOTCHCAST Resins

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Douglas Randall, Inc., Westerly, R.I., is a specialist in designing coils to unusual and precise specifications . . . then building the coils in production volumes. In producing "tailor made" coils, which must often meet difficult physical, electrical, or environmental needs, they rely on "SCOTCHCAST" Epoxy Resin to impregnate and encapsulate coils with their own vacuum impregnating process called "PERMA-MOLD".

"SCOTCHCAST" is an easy-to-handle liquid epoxy type resin which cures into a solid, shock-resistant, moisture-resistant plastic. It sticks tight to terminals and leads, most metals, plastics, and conductors; is resistant to acids, alkalies, solvents, oils, and water. On the production line, it can be poured or injected with precise control and predictable results to cut rejects.

"SCOTCHCAST" *Resins are available in a wide variety of properties and forms to meet any design specifications. For further information, write on your letterhead to: 3M Co., St. Paul 6, Minn., Dept. CA-47.*

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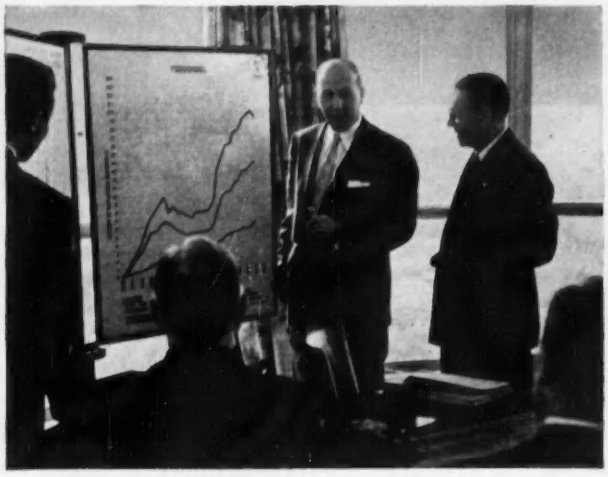
EXECS in the news



RADARMAN Busignies and staff: from a 300-ft tower, long views

PROUD papa of air-traffic aid Tacan and its new data-link is Henri Gaston Busignies, 52-year-old president of IT&T subsidiary Federal Telecommunications Laboratories. In the board room atop Federal's 300-ft pylon in Nutley, N. J., engineer Busignies confers weekly with board, staff, engineering committees. Object: find long views, new horizons. "There's no limit," he says, "to what you can do with electronics."

He is somewhat shy at first meeting, seems to sit the white horse of his presidency uneasily. After some conversation on favored topics—medical electronics, radar, communications—shyness evaporates, the long Gallic countenance animates and the smile appears.

Born in Sceaux, near the French capital, Busignies took his University of Paris degree to one of IT&T's overseas labs in 1928, has stayed with the company ever since. He was one of the pioneers of radar in the 30's, came to this country in 1940 after heading a radar development program in France, took over one of the then-new Federal labs. Naturalized in 1953, he became an officer of Federal the year after, last year was elected president.

Daughter Monique is married, leaving Busignies and his "patient wife, who understands much," the full run of their Montclair, N. J., home. A dedicated homebody "when I get the chance," Busignies just finished redoing the whole place.

Strictly PERSONAL

Cosmic Rays

There are facets of research sponsored by the International Geophysical Year which have received little mention. For instance, at the University of Maryland's physics department, work currently is underway in cosmic ray research. . . This area of study has been somewhat overshadowed by the earth satellite and other IGY projects.

Physicists at Maryland have been firing rockets to collect data indicating cosmic ray intensity in the upper atmosphere, and have built banks of large geiger tubes to collect data on variations present in large-scale counts. The larger tubes have been flown by the Air Force

at various altitudes in an attempt to study the effect of the atmosphere on cosmic ray scattering.

Of course, the earth satellite is also a part of Maryland research...

PHILIP C. GERACI
HYATTSVILLE, MD.

. . . and Sleeping Proofreaders

We read with great interest the recent article on the participation of management consultants in electronics companies' business problems (Back Door to Front Office, Mar. 10, p 19). In your article you quoted us, and I am writing to let you know that our firm's name is William E. Hill & Co., not Will E. Hill.

Otherwise, we thoroughly enjoyed the article and we want to take this opportunity to congratulate you on the Business Edition. It fills a long-standing editorial void in this field.

WARREN B. RILEY
WILLIAM E. HILL & CO.
NEW YORK

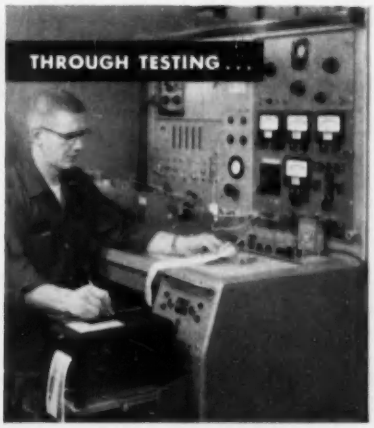
The "iam" dropped out somewhere between the editor's copy and the printed magazine. A staff of proofreaders who would normally question the rising of the sun seem to have let this one slip by—early spring fever perhaps.

Which reminds us that our Executives in the News for the same edition mistranslated Intec as International Electronics Corp. The Int, be it known, stands for Intercontinental.

Servoflexitronic Autocybermation

R. D. Gloor (Mar. 10, p 11) makes a contribution by introducing the word *cybermation*. To describe and identify our technical progress we will need additional vocabulary. Automation may branch off . . . into such things as *fleximation*, *dynamation* or *servomation*, and we may likewise break down . . . electronics into *cybertronics*, *flexitronics*, etc. Eventually then it is necessary to decide before the list gets too long whether we are only creating confusion.

ROBERT E. VERKELER
LOCKHEED AIRCRAFT
ONTARIO, CALIF.



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SPRAGUE

AXIAL-LEAD POWER RESISTORS ARE NOW AVAILABLE TO MEET ALL CHARACTERISTICS OF MIL-R-26C

When you want a lot of power in the smallest possible package—you'll be greatly interested in the Sprague Blue Jacket Resistor Type 151E——one of the smallest 3-watt resistors ever made. In Mil-R-26C it is designated as RW59.

Military designers find Sprague vitreous enamel Blue Jackets Type RW57 (5-watt) and RW58 (10-watt) Characteristic G and V resistors, extremely useful for point-to-point wiring on terminal boards.

When vibration is a factor in equipment, Sprague's Koolohm Resistors are designed to solve your mounting problem. They mount directly to chassis with a wrap-around clamp and still withstand a ground test voltage of 10,000 volts.

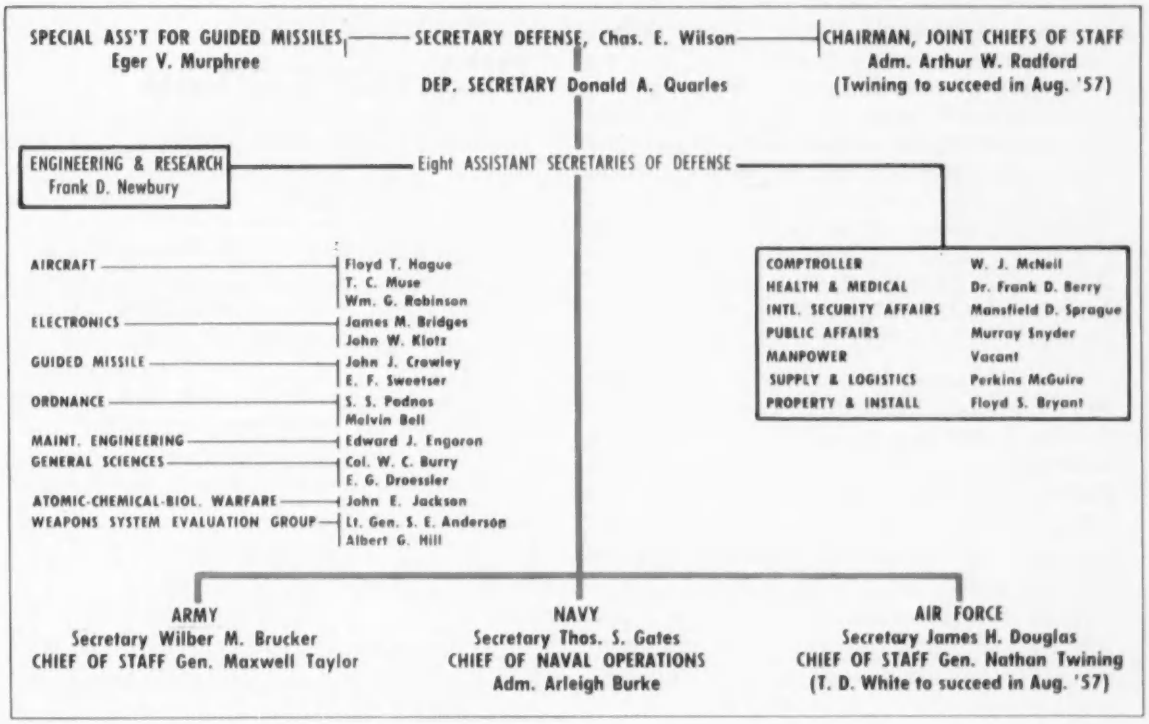
Sprague Koolohm Resistors have compiled an outstanding service record in military equipment for more than 15 years. Axial-lead Koolohms, encased in a ceramic shell are designated RW55 (5-watt) and RW56 (10-watt) Characteristic G resistors.

The Sprague family of axial-lead resistors offers a complete range of sizes, ratings and characteristics to meet your requirements. They're designed to give you the stability and the physical and atmospheric protection you want. Write for Engineering Bulletins. ★ ★

SPRAGUE ELECTRIC COMPANY • 35 MARSHALL ST. • NORTH ADAMS, MASS.

electronics
business edition

APRIL 20, 1957



NEW Pentagon batting order gives electronics "first licks"

PENTAGON shuffles chiefs

- **Electronics-minded men rising to top of heap**
- **Spending will remain high in our field**
- **But look out for drive on "waste" in R&D**

MILITARY's high command—civilian and uniformed—is undergoing its biggest shakeup since Eisenhower took over from Truman five years ago.

In the past few months, half a dozen top civilian jobs have been turned over to new men. Now, the top uniformed command—the joint chiefs of staff—is being revamped.

Before summer is over, Charles E. Wilson may leave as Secretary in charge of the whole $36-billion shebang.

Spending for electronics in guided missiles, aircraft or other programs will remain high. May go even higher.

But in at least one top spot, a man has arrived with ideas which—if put into effect—could bring some grief to hundreds of electronics firms engaged principally in military R&D.

Pentagon is taking a close look at "extravagant" employment of scientists and engineers in research and development of military electronics. This is taking place under Frank D. Newbury, 75-year old

ex-Westinghouse v-p, who has become Assistant Secretary of Defense for Research and Engineering.

Out of it could come changes in R&D contracting: new curbs on inviting technical proposals before award of R&D contracts; simpler military specifications; orders to give first production orders to the shops which design new equipment.

Newbury's job is to run military programs for research, development and production engineering. For the past four years, he had been Assistant Defense Secretary in charge only of production engineering.

Newbury believes military R&D projects "employ engineers much more extravagantly than they should." He has approval from Wilson to probe the problem. Newbury's Director of Electronics, James M. Bridges, former electronics director for Navy's Bureau of Ordnance will run the show. He is slated to head an interservice committee of engineers to find out how much scientific and engineering manpower is wasted in military R&D and tell how to stop it.

Study will focus on electronics because of Bridges' own background and because the technical manpower shortage is worst here. Newbury's staff thinks it already knows a lot of what's wrong and what to do about it. For example:

They think it is wasteful to get detailed technical proposals from a lot of firms before awarding an R&D contract. Bridges says that recently 30 firms were asked for proposals on how they would design a new radar. He estimates 60 man-years of engineering were tied up to prepare the 30 proposals—about 10 percent of all the engineering work that will go into the job.

Bridges feels that almost all this use of engineering manpower is wasted, that development contractors can be selected just as well through management surveys of contractors by the military—without asking for detailed technical proposals.

Newbury's staff thinks the first production of a new item should be done by the shop that develops it, so as to save engineering work.

New DOD lineup

IN RESHUFFLING of top Pentagon jobs, the men who believe in air power have gained authority. Two of the Pentagon's three top jobs, Deputy Secretary of Defense and Chairman of the Joint Chiefs of Staff, have gone to men who prefer air power.

Here's rundown on new promotions:

• Donald A. Quarles, ex-Western Electric v-p, steps up from Air Force Secretary to Deputy Secretary of Defense. Insiders say he is slated to become Secretary of Defense this summer if Wilson resigns.

• Air Force Under Secretary James H. Douglas, former Chicago and Washington lawyer, replaces Quarles as Secretary of the Air Force.

• Thomas A. Gates, investment banker and former Navy Undersecretary, takes over from Charles Thomas as Secretary of the Navy.

• General Nathan F. Twining, Air Force Chief of Staff, will succeed Admiral Arthur W. Radford this Summer as chairman of the Joint Chiefs of Staff.

• General Thomas White, Air Force Vice Chief of Staff, succeeds Twining.

PILL goes on air

AN F-M transmitter encapsulated for swallowing was announced last week. Once inside the human intestine, a 2N184 junction transistor broadcasts activities of the digestive tract. Signal frequency is 1 mc.

Radio pill was developed and tested by Rockefeller Institute, New York Veterans Administration Hospital and RCA. Pill was designed by Vladimir K. Zworykin and associates as envisioned by Dr. John T. Farrar.

Device will help doctors study gastrointestinal pressure, possibly temperature and acidity. It is encased in Lucite 1⅛ in. long and 4/10 in. in diameter. One end is a pressure-sensitive rubber diaphragm.

Transistor oscillator is frequency modulated by pressure changes in the body. Signal is detected up to three feet away. Transmitter requires only 3/10 mw.

Transistor and ferrite-cup inductance core are in pill's center. At one end is replaceable storage battery. Battery lasts 15 hours, but researchers are working on recharging it from outside the body.

F-M' casters bullish

INDUSTRY and FCC both forecast growth for f-m. Comr. Robert T. Bartley says Commission plans study of all allocations between 25 and 890 mc, which includes f-m. He says there will be hearing within 40 days, comments received until July 1.

John F. Meagher, NARTB v-p for Radio quotes three major manufacturers on f-m equipment plans: RCA may make new line after a study now in progress. Gates will continue making f-m gear. GE has no present plans in field. Meager says f-m channel demand is spotty: 9 channels vacant in Minneapolis-St. Paul, 6 applicants vying for 3 channels in Los Angeles.

Harold Tanner, WLDM, Detroit, says auto makers are hopeful about f-m car radios. Thinks a major manufacturer will start making f-m car sets in near future.

Gardiner Greene of Browning Labs, Winchester, Mass., sees f-m set potential of 40 million with new gadget made by his firm. It tunes f-m band through tv set. Price: at first $20, latter $12-14.

Want PRIVATE-LABEL work?

It's cost plus six percent and you know you're getting it

But look out for overdependence, it may be dangerous

Be prepared for buyer to exercise his option for more sets

INTERESTED in private-label manufacturing? Many tv setmakers are. Producing for department stores and retailing chains is important business.

Private-label manufacturing is one way to get over lulls in production schedules. It's also a way of easing inventories of brand sets without stopping production.

Although most private-label production is done for retail outlets, some setmakers do it for other setmakers.

Companies with new developments have turned out sets for competitors who cannot tool up in time to keep pace. Advantage is the same as when dealing with retailers, but the risk is less.

Orders from retailing organizations are customarily small, with option to buy more sets during the year. This often boils down to 5,000-10,000 set orders to fill about three times a year.

"It's not big potatoes," says the president of a small set-manufacturing company, "but it's cost plus six percent. At least you know you're making it."

Recent agreement between Westinghouse and Montgomery Ward points up big-company interest in private-label set making. However, big-company interest has been high for several years.

One big company admits that as much as one-quarter of its tv and radio set production has been for private label.

"It's a matter of keeping the factory going," says another.

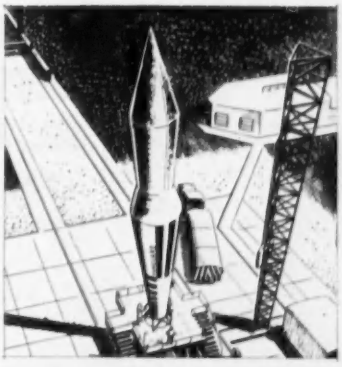
Still another thinks it's present importance is to "get inventories leveled."

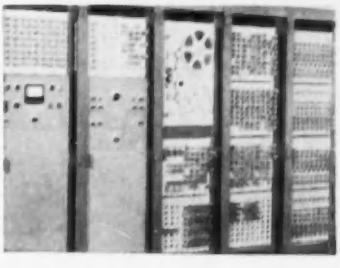
Options exercised by the retailer can create sticky situations for the setmaker if they come unexpectedly.

Another caution, expressed by one manufacturer, is that overdependence on private label making can be dangerous. "It can hurt if it suddenly ends."

Some firms now active in private label voice no fears. Making sets for Firestone, Western Auto,

TECHNICAL changes to watch





• **Artificial** moon carrying 48-channel, 7-lb magnetic-transistor telemeter will probe radiation in near space, measure ambient temperature, count micrometeorites. Programmed gyro-stabilized rocket, top right, will fire moon into orbit (page 20).

• **Analog-to-digital** converters continue to gain in speed, accuracy. One conversion a second was par four years ago, 200,000 a second today. Accuracy increased from 0.1 to 0.05 percent. Digitizer, lower right, has 18 voltage input channels, punched card output (24).

• **Australian** radio-operated tractor has eight-button control panel. Tv supervision of farming may be next step (44).

• **Uhf** beacon transmitters packaged in sardine cans help search planes find test missiles that come down over water (21).

• **Improved** design and testing helps airborne digital computer operate 450 hours with only four minor failures (32).

Montgomery Ward and some department stores. Hallicrafters finds private label work rewarding.

William Halligan Jr., the company's sales v-p, give it major credit for his favorable profit picture.

"We lost close to $1 million three years ago," he says. "We'll make a million in '57."

His other reasons for liking private label:

- "It's a contract business. The customer tells us what he wants. We build for the market."
- "We don't have to worry about distribution and promotion money."
- "We have a stability of accounts."

Retailers claim, almost to a man, that private-label tv set sales are steady.

ATOM delivers power

FUTURE portable instrument power supplies may not have to rely on chemical reactions. Nucleonic and photoelectric techniques can produce power cells with stable output from 100 C to −200 C and lower. These may become commercially feasible with the opening of a new AEC separation plant.

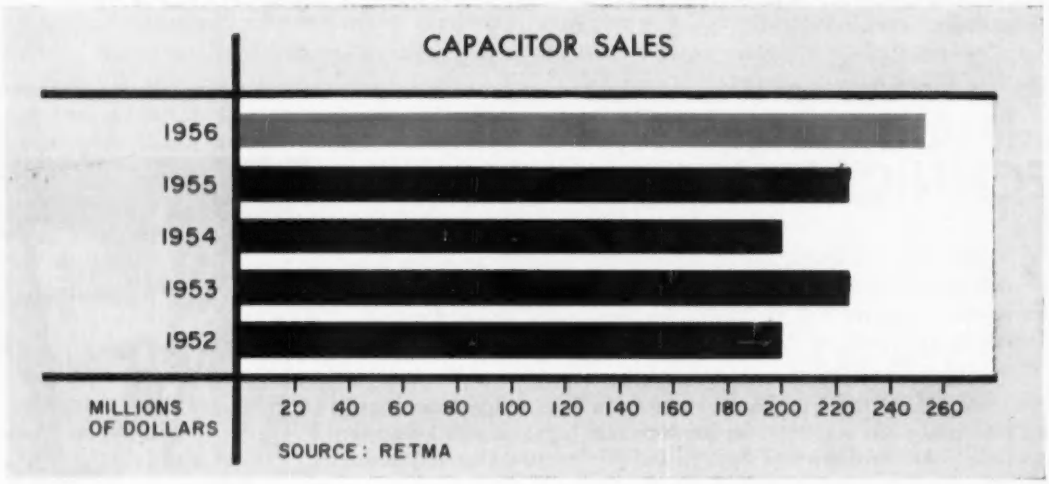
Tests on a Walter Kidde Nuclear Labs' prototype cell disclose that it puts out slightly more current at −200 C than at room temperature. This promises some immunity from the low-temperature problems of outer space.

The Kidde cell uses a cadmium sulfide phosphor mixed with promethium oxide, a fission byproduct. The phosphor responds to beta radiation from the radioisotope by emitting infrared light. A plastic window passes the infrared emission to a silicon solar cell, which delivers electric current. The two-stage process protects the semiconductor from direct radiation damage, lengthens cell life.

Promethium now costs $500 a curie. New AEC separation facilities to be readied this year should make the radioactive stuff much more readily available, and may drop the cost to 50¢ a curie.

Promethium oxide has a 2.6-year half-life and radiation characteristics which offer no serious shielding problem. Kidde's work was done for Elgin Watch Co., which estimates that the cell could power a watch with only a $\frac{1}{16}$-in. shield.

PRODUCTION and SALES statistics



Capacitor sales for 1956 were $255 million, 13¼ percent more than the $225 million sold in 1955.

The 1956 figure sets a record. Previous sales high of $225 million was set in 1953. Record was tied in 1955.

Breakdown of capacitor sales was recently supplied by Census of Manufacturers for 1954. Paper capacitors account for largest part of dollar volume, 43 percent. Electrolytic types with 25 percent are next, followed by ceramic and mica with 17 and 9 percent respectively.

Electronics Output Index averages 272.1 percent in 1956. In December 1956 it stood at 295.0. Average for 1955 was 225.8.

Manufacturers' sales in 1956 average 20 percent above 1955.

Communication equipment production workers numbered 407.8 thousand in December 1956, some 15 thousand above November. Average number employed throughout 1956 was 397.8 thousand.

Average weekly hours worked by communication equipment production workers amounted to 40.8 for December 1956 compared with 41.3 for December 1955.

LA fights ENGINEER shortage

Local firms join school officials to reach high school students

Strengthen science curriculums by helping hold teachers

Tours and lectures heighten student interest in engineering

EVERYBODY IN OUR industry talks about the engineer shortage but out in Los Angeles they are doing something about it. Last month LA's industry-education program shifted into high gear as representatives of 60 firms, many of them in electronics, met with city school officials.

Root of the engineer shortage is in high school. More than 200,000 high school graduates throughout the country have the ability and money to go to college but do not do so.

Twin-pronged attack on the problem entails buffering high school science curriculums and motivating high school students to prepare for and attend engineering schools.

According to Superintendent of Schools Ellis Jarvis, here's what industrialists and educators are doing:

Several demonstration-lecture programs by teams from local firms have been presented before science classes in LA high schools. More are being arranged.

- Specialized equipment, generally unavailable to regular teachers, is being featured.
- Companies provide lectures in the subjects that most closely correlate with their own activities.

Local industry arranges for summer employment of science teachers. Advantages are threefold:

- Teachers are brought up to date with recent developments.
- They are provided with a substantial supplement to their regular income.
- Industry's manpower shortage is partially alleviated.

Rubbernecking tours of local plants are set up for high school groups. Research and development facilities are stressed, rather than production and assembly operations. Idea behind this: students will want to follow the footsteps of engineers and scientists they observe.

According to De Forest Trautman of Hughes Aircraft, his company's temporary employment program for high school teachers was highly successful last summer.

Ten LA teachers served, at standard teachers' salaries, as assistants in Hughes' research departments.

Industry is on its honor not to make the teacher shortage worse in this program. Proselyting high school teachers for engineering jobs is out.

In fact, next step is to extend the industry-education program into junior high. Eighth grade general-science classes will also participate.

Even in high school it may be too late to strike out for an engineering career. Students who decide to switch to scientific fields in 11th or 12th grade frequently find they lack earlier courses.

Here are a few results of LA's program to quicken teenage interest in engineering and science: In 1954, the number of students enrolling for algebra was 12,093. In 1956, the number jumped to 16,817. During this same period enrollees in 12th grade physics went from 1,962 to 2,367. Meanwhile total high school population in Los Angeles increased only 10 percent.

Measuring MILLIONTHS

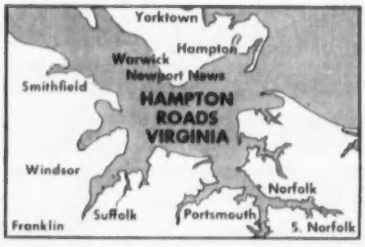
TECHNICIAN in Sheffield Corp. laboratory uses electronic gage block comparator to check industrial gage blocks. Blocks are checked to millionths of an inch via circuits which amplify 10,000 times

Hampton Roads VIRGINIA

Nation's first deep-water site first choice for your plant

"Our shippes do lie so neare shoare that they are moored to the Trees in six fathom water." So wrote Master George Percy, one of Virginia's first colonists, who sailed into Hampton Roads in 1607. And today, this superb port still offers a choice of deepwater locations for your new plant.

Amoco, Nestle, Lipton and Dow are among the leaders who have recently chosen this key port-industrial area. The competitive advantages they find here can profit your new plant as well.



Top sea, land, air transportation link you with markets and sources of supply. You're central to the whole East, with favorable freight rates to the Mid-West. You have your choice of 9 main line railroads, 45 truck lines, 3 major airlines, and 300 shiplines.

Ample electricity at low cost flows from VEPCO's modern network. Capability is already 1,362,000 kilowatts—and will reach 2,000,000 kilowatts by 1959. Natural gas also serves our area.

Ask for full facts on mild living-and-working climate . . . young but conservative manpower . . . favorable taxes . . . fine educational, recreational facilities. And for confidential site-finding help, write or phone VEPCO, serving "The Top of the South."

SEE SIGHTS AND SITES! Visit Jamestown Festival, April 1-Nov. 30, 1957. And while here, see some of Virginia's plant sites.

VIRGINIA ELECTRIC and POWER COMPANY
Clark P. Spellman, Director—Area Development
Electric Building, Richmond 9, Virginia • Phone: 86-1411

MARKET research ups sales

- **Market surveys get greater emphasis in electronics**
- **High incidence of new-product failures provide impetus**
- **Field study determines what customers want**

THE AVERAGE electronic product lasts 3 to 5 years before it is made obsolete by new developments. A government study of 200 large manufacturers indicates that only one new product out of five is a success.

These and other hard facts are leading electronics firms to think twice before spending large sums to put a product on the market. The trend is toward greater emphasis on market research.

Market research attempts to determine who will buy what and for how much, before a product is manufactured. Specifically, market research aids a manufacturer in designing, developing, producing, financing and advertising a product that will sell at a profit.

GE's vice president in charge of marketing, Fred J. Borch, says: "We must focus our businesses on the customer's needs and desires, including those the customer is not aware of as well as those he knows."

Cost of developing an electronic product may range from a few thousand dollars for a conventional component to several million dollars for a complex system. If the product fails, this is only part of the loss.

Daniel J. Webster, marketing manager of Raytheon's Commercial Equipment Division, points out some additional penalties for product failure.

A company must continue servicing units sold even though production has been discontinued. Servicing a discontinued line often requires making limited quantities of special parts and selling them at a loss.

If another new product is made to replace the failure, the manufacturer can sometimes get out of the servicing dilemma. But, he may be obliged to take back the discontinued model and make an allowance on the new model.

An electronic product may perform better than the fondest hopes of the design engineer. The customer, however, may find it too heavy, the color not right or operation too complex.

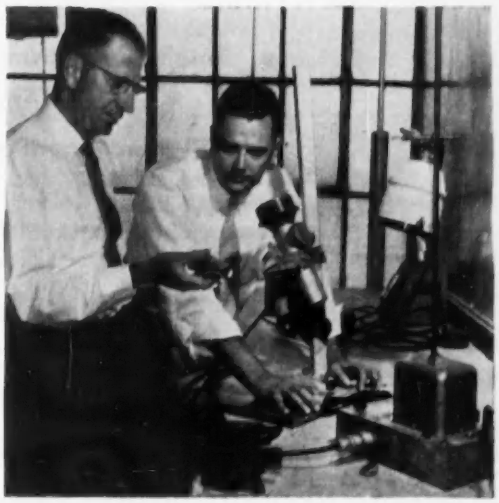
Success breeds success. If the product does what the customer expects, he is inclined to go back to the same manufacturer for other products. Trusting the product, he trusts its maker.

Webster describes how Raytheon's product planning committee handled a depth sounder for pleasure boats. Preliminary data was gathered, such as market potential, competitive situation, technical know-how, manufacturing facilities and estimates of return expected on investment.

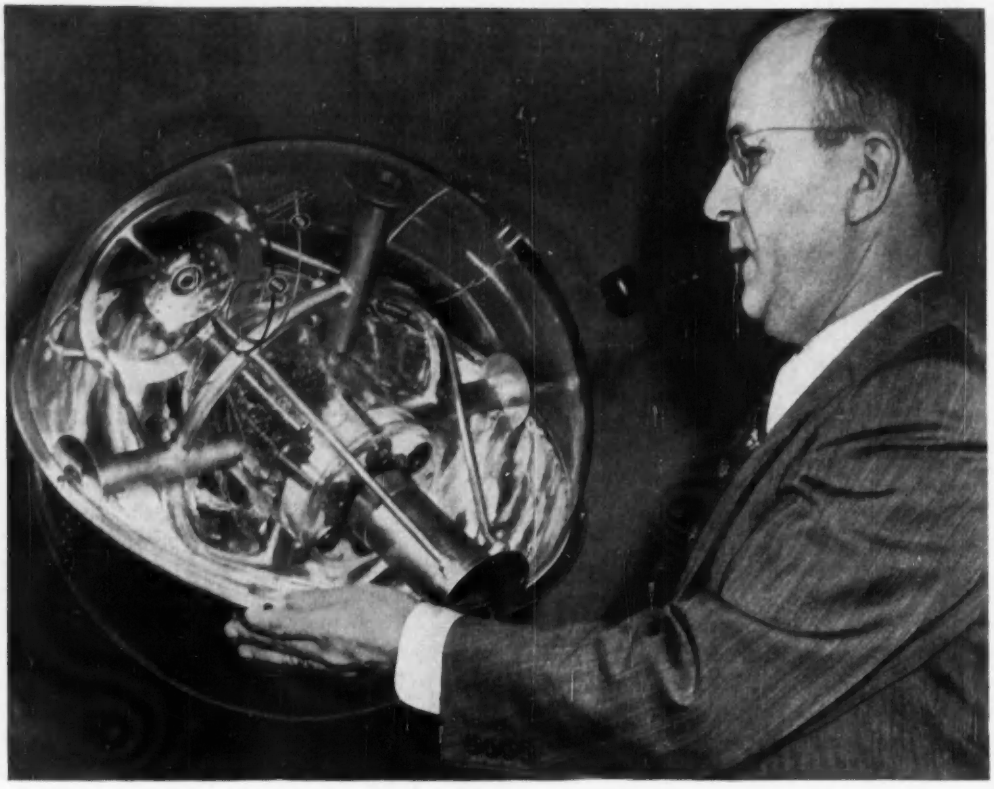
Then the manufacturer made careful surveys of potential customers to determine exactly what they wanted and how much they would pay.

When depth range, color, shape, size and other characteristics were established, a limited quantity of production models was made. These were sold at regular price, and their performance used for field evaluation.

INFRARED puts heat on



ENGINEERS are building device for Eastman Kodak to inspect film emulsion in dark. Each scope contains infrared source and converter tube with phosphorescent screen. The firm has built 150 scopes, each designed for a special task



VANGUARD project director Hagen does some closeup stargazing as . . .

Tiny MOON bears big hopes

- **Satellite's instruments may unlock solar secrets**
- **Big problem: little room for equipment**
- **NRL teaches reliable miniature design**

LATE THIS YEAR, if plans go well, a modified Viking rocket pushing an Aerobee second stage will place a new moon over the earth. Inside it, the payload of the operation, will be a 178-cu in. cylinder containing some of the smallest telemetering and transmitting gear ever built.

The satellite, being built under the direction of Naval Research Lab's John P. Hagen, is one of six currently planned as part of U. S. participation in the International Geophysical Year (July 1, 1957 through the end of 1958). Scientists hope that one or more of the spheres will remain aloft and send back information about solar radiation and the environment of space.

The instruments in the satellite will have to be small and light. Each ounce of weight makes groaning demands on the vehicle that will put the sphere in the sky. And once aloft, the instruments must work without attention.

Equipment on the ground will track the 21-in. diameter sphere as it orbits around the earth. A ground-based computing center directed by Ohio astronomer Paul Herget will process the position data to find out more about the earth's shape, mass distribution, intercontinental distances and upper-air densities.

Instruments in the satellite will measure its temperature, count the number of micrometeorites and larger particles that strike it, and measure Lyman-alpha radiation.

Three kinds of equipment will be spaceborne: the measuring instruments, a telemetering encoder and a radio transmitter to beam the collected data earthward once each orbit. The complete telemetering and transmitting gear weighs less than ten pounds.

The instrument compartment is a cylinder 7½ in. high and 5½ in. in diameter. It will be divided into ¾-in. basic segments. The bottom 3 in. will be taken up by the 15-oz power supply—silver-cell batteries capable of running the equipment for about three weeks.

Information about Lyman-alpha radiation has been eagerly sought, since the same solar storms that produce this radiation at 1,215.7 Angstrom units also affect both the weather and radio transmission. All rocket-borne instruments fired up so far have provided only about an hour's observation from altitudes higher than the level of the ionosphere where the Lyman-alpha line is absorbed.

The Lyman-alpha detecting instrument is a photon detector sensitive to the region between 1,100 and 1,340 Angstrom units. A silicon solar cell will determine the position of the satellite with respect to the sun.

Peak Lyman radiation for each orbit will be stored in a magnetic core. The flux level in the core, proportional to the peak radiation, will control the frequency of an oscillator which will modulate the Minitrack radio transmitter.

Thermistors will measure the temperature inside the insulated instrument cylinder and on the satellite surface. Extremes of temperature such as the enormous heat of the launching will not be accurately measured.

Thin-film resistors cemented to the surface will measure erosion. Special microphones will respond to collisions with micrometeorites—particles as small as one ten-thousandth gram. A puncture in the surface of the sphere will be detected by aneroid pressure gages in two sealed compartments built into the surface.

Once each orbit, as the satellite passes over the meridian which runs down the eastern coast of the U. S. and the western coast of South America, the 7-lb. Minitrack transmitter will broadcast the information collected during the orbit.

A 48-channel encoder which uses magnetic circuits and transistors will sample each of the instruments. The encoder controls the modulator for the Minitrack transmitter. Information beamed to earth will be a series of high-frequency bursts. Intelligence will be contained in the frequency of the bursts, the time-duration of each burst and the interval between bursts.

The ground stations, lined up on the two coasts of North and South America from Blossom Point, Maryland, to Santiago, Chile, will record the data on high-resolution magnetic tape. This magnetic tape, in turn, will be used for oscilloscope viewing and analysis.

Technical DIGEST

New epoxy adhesive replaces silver soldering for bonding two Alnico permanent magnets to lamination stacks of Westinghouse recording wattmeters. Bondmaster M620 adhesive used does not flow or drip during oven curing. Thumbscrews in positioning fixture give adequate pressure.

True black box is new calibrator for photoelectric street lighting controls, made by Fisher-Pierce. Control plugs into spring contacts on hinged front panel. Panel swings up to close dark chamber. Lamps inside are turned on and off to simulate sunrise and sunset.

Printed wiring boards made by GE for 1957 Oldsmobile instrument panels need no soldering. Snap-in fixtures hold dashboard lamps, make direct contact with wiring. Eleven terminal pins staked on board permit making all external connections with single 11-pin socket.

Ultrasonic treatment of pasteurized milk, packaging in polyethylene bags and quick-freezing in brine may permit one-year storage to take care of over-production, permit shipment to milk-short countries. Licenses are being granted by National Research Development Corp., London.

Pickling solution for cleaning copper does not develop dangerous fumes, is only mildly acid, inhibits further tarnishing for two weeks. This Becco process uses water solution of ammonium persulfate at room temperature, with dip for 30 seconds.

Loading cold-setting resin with carbonyl iron particles gives excellent dissipative material for making matched terminations of waveguides. In tests at Telecommunications Research Establishment, England, various ratios of 5-micron iron and Marco resin gave wide range of electromagnetic properties.

Sardine cans prove to be ideal housings for miniature uhf beacon transmitters built by Fairchild. Teflon cushions in can support etched wiring panel with subminiature oscillator tube and two-transistor power supply. Beacon helps planes locate missiles test-fired over water. When can hits water, explosive squib pushes out telescoping antenna, starts radio transmission.

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DIGITIZER sales double

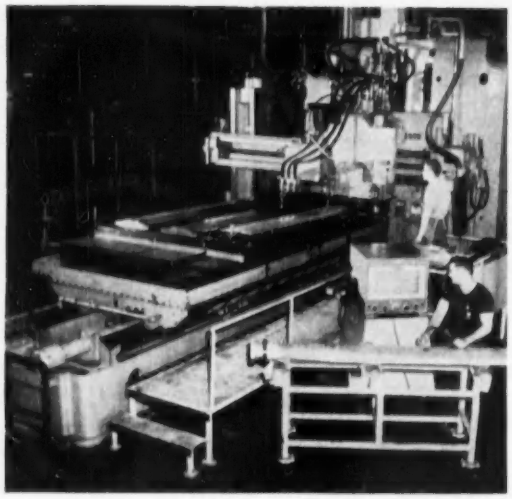
- **Firms report 100-percent sales rise each year**
- **Speed increases from 1 conversion a second to 200,000**
- **Accuracy, reliability also better in new systems**

SALES OF digitizing devices, often called analog-to-digital converters, are climbing about 100 percent per year. And road's end isn't in sight.

Digitizers are getting faster and more complex all the time. One voltage conversion per second was usual four years ago. Today at least one system is geared for 200,000 per second.

By way of a refresher: In telemetering and process-control equipment physical quantities such as temperature and pressure are measured in voltage, a graphical or so-called analog quantity. The digitizer samples voltages at a rapid rate and converts them into digits that can be printed out by a high-speed printer, recorded on punched cards or magnetic tape or fed directly to a digital computer.

Like a hole in the PROP



RESONANCE tester by Branson is used at Hamilton Standard division of United Aircraft to measure wall thickness of hollow aluminum propeller blades. Extrusions are checked as received from fabricator, after machining on tracer controlled planers (above), during final machining for balancing and at final inspection

Digitizers find applications in wind-tunnel and missile test-range instrumentation, radar-computer systems like SAGE and machine-tool controls.

For years information was acquired in graphical form. Much still is. However, digital data is often preferred for ease and speed of handling.

Accuracy in digitizers has improved from 0.1 percent to 0.05 percent.

Reliability is also much improved, reports Joseph H. Davis, executive vice president of Epsco, a Boston manufacturer of digitizers.

"Four years ago, the reliability wasn't so good. Today our reliability average for units is 5,000 hours. One machine ran steadily under test conditions for 8,700 hours without even an electron tube failing."

The first digitizers converted shaft positions into numbers. Now the variety of tasks they perform is almost endless. They can digitize radar returns, simulated missile operations, geophysical and oil explorations, aircraft flights and contours of metal parts to be machined.

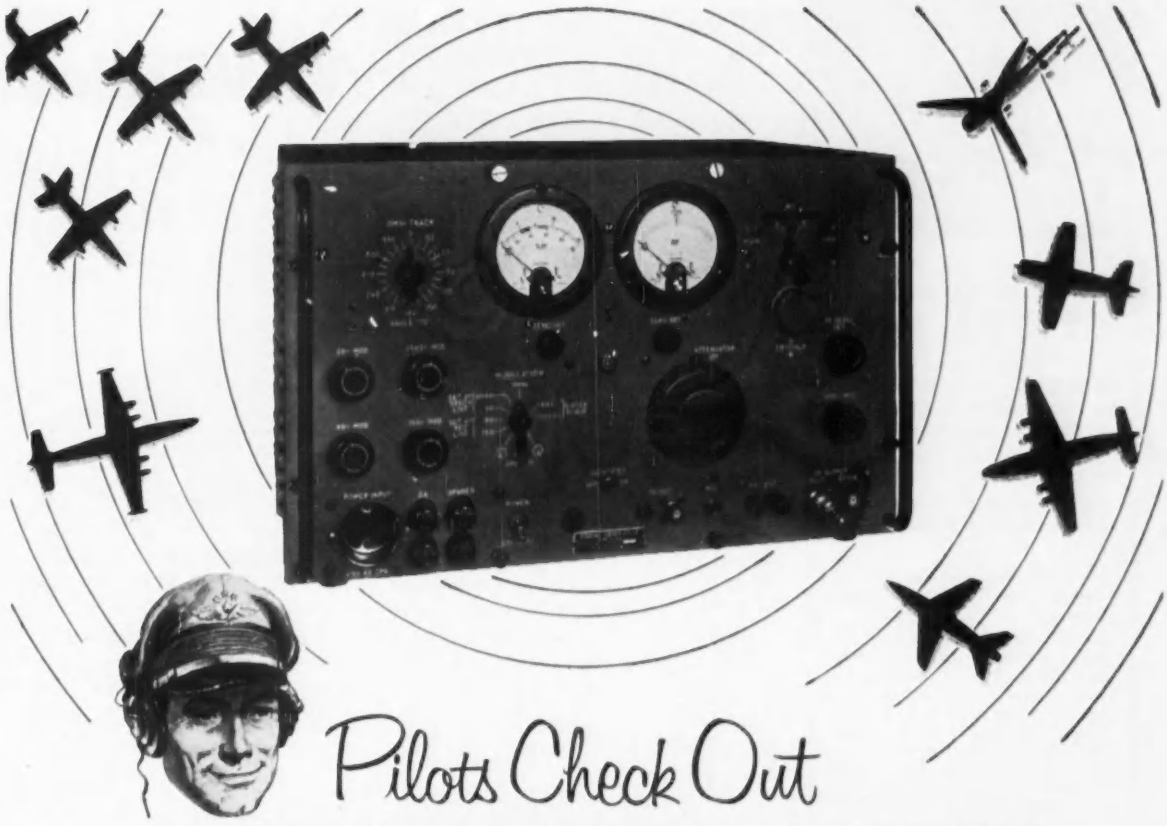
The price of a digitizer is tremendously dependent on what it will be used for.

Epsco has five basic types of digitizers ranging in price from $8,500 to $20,000. Baird-Atomic of Cambridge, Mass. which makes moderately high-speed digitizers, sells 10-conversion-per-second units for $1,500 to $3,000. Its 5,000-per-second machines sell for $5,000 to $10,000. Such units can reach 20,000 conversions per second in special applications.

At Baird-Atomic, Hugh F. Stoddart, vice president, says:

"The major market now isn't for high-speed digitizers. Ten conversions per second is enough for many applications. Specialized uses are something else. Some require extremely fast speeds, and when the need is there, it is great. But I can't see a widespread need for high-speed units yet."

Digitizers have enjoyed marked success when used with computers. As for paying for themselves, some digitizers have, it's reported, done so in remarkably short time. One $250,000 system paid for itself in a few months.



Pilots Check Out
NAVIGATION RECEIVER ACCURACY

ARC Type H-14A Signal Generator Checks Omni/Localizer Equipment

ARC's H-14A Signal Generator provides a simple and dependable means of checking *omnirange* and *localizer receivers* in aircraft on the field, by sending out on the hangar antenna a continuous test identifying signal that blankets the field. Tuned to this signal, individual pilots or whole squadrons can quickly test their own equipment. Voice can be transmitted simultaneously with signal. The instrument will check 24 omni courses, omni course sensitivity, operation of TO-FROM meter and flag-alarms, left-center-right on 90/150 cps localizer, receiver frequency calibration, reciprocal course accuracy, and receiver output. The H-14A is also widely used for making quantitative measurements on the bench during receiver maintenance. Input power is 160 watts, 115 volts 60 cps.

The H-16A Standard Course Checker measures the accuracy of the indicated omni course in ARC's H-14A or other omni signal generator to better than ½ degree. It features a built-in method of checking its own precision.

ARC's Type H-12 Signal Generator (900-2100 mc) is equal to military TS-419 U, and provides a reliable source of CW or pulsed rf. Internal circuits provide control of width, rate and delay of internally-generated pulses. Complete specifications on request.

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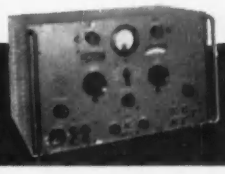

Type H-12
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Type H-16
Standard Course Checker

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New SHORTWAVE sales

Teenage interest gets credit
May boost sales to $20 million in '65
100,000 have already bought

SHORTWAVE receivers are again becoming popular with people who have no real need for them. They apparently just want a radio with "something extra." No one has reduced the size and shape of this section of the market to statistics. But most sw makers are aware of its presence. One guess was hazarded: 100,000 people with no need for sw have bought receivers.

Hallicrafters gives teenagers credit for revival of shortwave listening. William Halligan, Jr., Hallicrafter's v-p in charge of sales, thinks sw listeners are at least partially responsible for the increase in the total shortwave receiver sales from about $10 million in 1947 to $15 million in 1956.

One industry estimate on the future: sw listeners will raise total shortwave receiver sales to $20 million a year by 1965.

Collins has noted the presence of new buyers.

National's sales manager, Ben Ballard, thinks the new consumer sw market is large enough again to make inexpensive receivers feasible to produce.

TITANIUM for chassis?

TITANIUM, the jet-plane metal, is not yet off the ground in electronics. But its freedom from gaseous impurities, high heat resistance and anticorrosion qualities are awakening interest.

A major effort is adapting it to tube parts. Gene Erbin, metallurgical sales engineer of Titanium Metals Corp. of America, has high hopes for its application as a getter to remove residual gas from vacuum-tube envelopes. The metal, he says, has an affinity for oxygen, nitrogen and other gases.

Other developmental uses are tube supports, anodes and grid elements. Titanium shares with zirconium the distinction of not giving off gases while tubes are operating under low pressure at high heat.

Titanium is also being considered as a weight-saver in structural parts. It compares with high-grade steel alloys in corrosion resistance, but its weight is half steel's.

Only a miniscule portion of total titanium production is being bought by electronics firms. Most of it goes into jet-aircraft engine and skin parts. There is no shortage for civilian uses. Although civilian industry's quota is 10 percent of total production, only two or three percent has been consumed in nonmilitary uses.

An estimated $1 billion has been spent by government and industry in developing production and use of titanium. Processing is difficult, but most of the technological problems have been met. The major difficulty now is getting processing equipment built fast enough to keep up with demands. Major users have to wait for delivery. Experimental quantities can generally be bought off-the-shelf.

Production of basic titanium sponge, a few tons in 1948, was 14,500 tons in 1956 and is expected to reach 25,000 tons in 1957. Sponge price is now $2.75, half of 1948. Average price of titanium mill products is $13 a pound.

Navy to test SSB

SINGLE-SIDEBAND radio equipment is in for a major test by the Navy's Bureau of Ships. The gear will be used for ship-to-ship and ship-to-air communications. If results are satisfactory, Navy double-sideband a-m equipment buying for the high-frequency range (2 to 30 mc) may halt entirely.

In addition, the Navy will test a-m sets modified for both double-sideband and single-sideband operation. The converted gear is important to any long-range plan for putting all Navy radiotelephone on ssb. There is too much almost-new double-sideband equipment around to junk. Latter is an urgent consideration in any step the Navy takes in this matter.

Single-sideband equipment to be tested will use standard techniques of filtering and linear amplification.

Britain's BANKS to go automatic

A NATIONWIDE system of automatic banking has been agreed upon in principle by 11 major banks in the United Kingdom. It would substitute electronic techniques for most routine mathematical and mechanical operations.

No timetable has been set but first elements of such a system may be operating in two years. About 30 of Britain's electronics firms have been sent a "description of equipment requirements for bank automation." Requirements include development of electronic printing and sorting equipment.

The system will use magnetic inks capable of imprinting characters less than one-eight of an inch high on checks and other bank papers.

Each bank will probably centralize its accounting work for all branches, but no serious personnel layoffs are expected. In fact, the National Union of Bank Employees says the system would "further relieve the drudgery of some of the routine work and additionally open up avenues of more responsible work to some employees."

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Transistor rights unused

All Bell licensees don't make transistors

One reason: no relevance to product lines

Some may make units to fill future needs

TRANSISTOR manufacturing, a field that looked rosy to many electronics concerns six years ago, today sees some patent licenses not used.

Some 37 domestic companies have been licensed by Western Electric to make and use transistors. About one-third of these have not made transistors except for experimental use.

• Possession of technical know-how plus a license does not always mean an electronics firm is ready to do business as a transistor manufacturer.

• Financial condition of the company and the relevance of transistors to the company's current product line are the two biggest factors in determining if and when a firm goes into transistor manufacturing.

• Some companies want to make transistors only for their own use to suit specific needs when the time appears ripe.

Application of transistors to its product line is one of the factors stressed by Bulova Research and Development Laboratories. Explains Bulova: "We are presently producing a transistorized radio which appears to have strong market possibilities. As a consequence, considerable strength is added to the argument for making transistors for our own use, where this argument had not existed previously."

Here's what some other transistor-licensed firms say:

• Microwave Associates—"A small market in 1952 coupled with a large investment required have held up transistor manufacture."

• Baldwin Piano Electronics division—Transistors "can be purchased more economically" than they can be made.

• General Telephone Labs—"We plan to manufacture transistors at such time that the needs of our system require large quantities of them."

MIT to translate RED mags

INFORMATION about Russian electronics industry will be more available by the end of the year. Three of their electronics magazines are going to be translated into English.

At the end of April the National Science Foundation is expected to give a green light to the MIT suggestion that this be done. Translation by MIT will cost NSF from $17.50 to $22 a page. Number of pages per year for each of the three magazines is expected to be 1,000.

The three magazines will have as English titles: *Radio and Electronic Engineering, Electrical Communication* and *Radio Engineering*.

Reason for wanting this particular translation project is given by Paul Green of Lincoln Laboratories. He says, "The Soviets are doing good work in electronics and getting better. It behooves American electronics engineers to find out what the Russians are doing."

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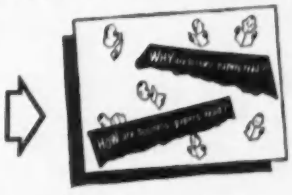

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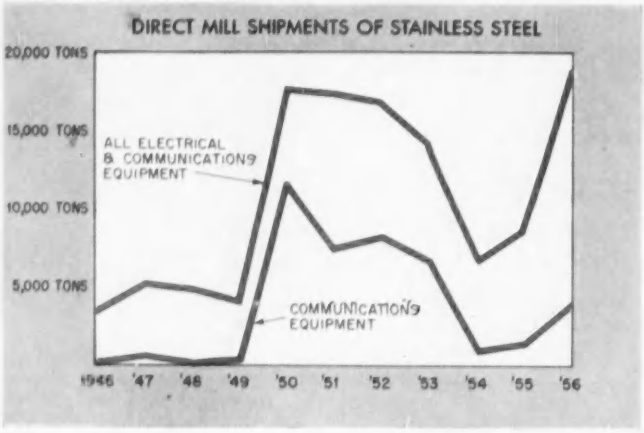


STAINLESS eases

Mills catch up to orders

Producers push low-nickel grades

Communications uses 4,000 tons

Fabricators of stainless-steel parts for electronic equipment report mill deliveries are now a matter of weeks instead of months. A Wilbur B. Driver Co. spokesman says most mills are ahead of schedule.

Release by the government of 55 million pounds of stockpiled nickel in 1956 and diversion of first-quarter 1957 stockpiling helped stainless-steel suppliers catch up, although most of the government nickel went into defense production.

To conserve their nickel supplies, stainless-steel producers are pushing hard for the new 200 series of stainless. It uses about one-half the nickel of the popular 300 series of austenetic stainless. U. S. Steel has a no-nickel stainless in production.

The 200 series is said to be equivalent in strength and corrosion resistance to the 300 series, and is two or three cents a pound cheaper. This is of little importance in small electronic parts, but can cut costs of big auxiliary equipment.

Allegheny Ludlum reports that 18,000 tons of 200 stainless was produced in 1956, compared with 1,886 tons in 1955. Overall production of stainless was about 680,000 tons, a few below the 1955 record.

Electrical and electronic equipment required about 19,000 tons of direct mill shipments, probably another 6,000 tons of warehouse shipments. Communications take 4,000 tons of direct mill shipments.

TIN declining to '55 price

Bulk tin prices can be expected this year to drop to 1955 levels. Tin-producing countries have agreed to stabilize prices around 90 cents to $1 a pound by sale or purchase of surpluses.

The impact of the Suez crisis and U.S. dock strikes are about over. Tin sold for $1 a pound at the end of 1955 and leaped to $1.13 with Suez. By the end of January, it was down to $1.02. *Engineering and Mining Journal* estimates that, barring further trouble, prices will stabilize between 95 and 90 cents in 1957, which was the mid-1955 range.

There is no tin shortage. Worldwide consumption hit a post-Korean record of 156,000 tons in 1956, but production met demands. U.S. consumption of 63,000 tons was the highest in six years although smelting hit a new low of 17,631 tons. U.S. may smelt only 2,000 tons in 1957, but imports will take up the slack.

Tin is used in virtually every electronic product, in a variety of solders and platings, in phosphor bronze metal parts, ceramic compounds and capacitors. Miniaturization has increased use of plating to facilitate soldering with minimum flux. Plug-in component bases are frequently plated for lubrication. Tin alloys have been developed to replace pure zinc or cadmium.

UK plans color test in Fall

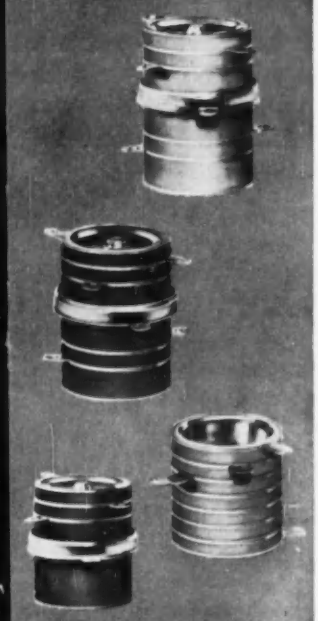
In Great Britain, progress is slowly but surely being made toward introduction of color television.

Both Houses of Parliament have been invited by the Postmaster General's Television Advisory Committee to observe color demonstrations. The problems to be solved are not only "colourvision" problems.

The question is also open as to whether to take this opportunity to reevaluate the present line standard of 405. Some in Great Britain are for increasing it to the so-called common European standard of 625 lines.

Black-and-white set sales are good. They were up 11 percent, 1.5 million sold in 1956 as against 1.3 million in '55. Setmakers hope that the present publicity over the possibilities of color tv does not lead to a slackening monochrome market.

Although attention is now centered on the Television Advisory Committee recommendation, it is not expected until Fall. And its opinions are not binding for Britain's tv boss, the Postmaster General.



New stacked ceramic receiving tubes that can withstand heavy shock and vibration

2CL40A A new, small ceramic high vacuum rectifier or clipper diode that can be air or liquid cooled

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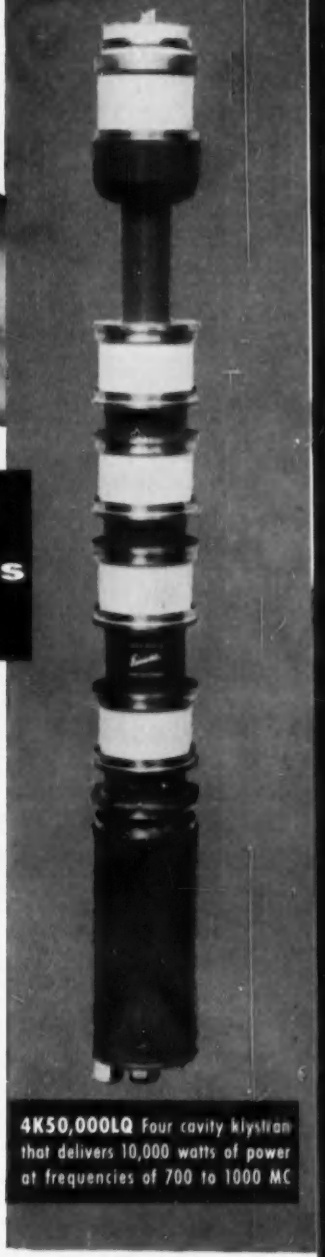
As first in the field, Eimac has developed ceramic tube manufacturing techniques that have evolved into well established processes.

For information on these as well as other Eimac ceramic "tubes that can take it," please consult our Application Engineering Department.



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See RELIABILITY payoff

Testing improves performance
Specs may stiffen requirements
Pentagon decries cut-rate design

INDUSTRY-MILITARY reliability programs are beginning to pay off, say top Pentagon officials. But, according to J. M. Bridges, director of electronics in the office of Assistant Secretary of Defense for Research and Engineering, "Emphasis on competitive pricing in both development and production is still a major deterrent to obtaining optimum reliability in electronic equipment."

"It is improbable," Bridges continues, "that highly reliable equipment will ever be produced if the price is forced so low that shortcuts in engineering are required."

Bridges asserts reliability can be improved by keeping the same contractor on the job through development and initial production.

He favors developing minimum acceptability figures for reliability that may be expressed as time-between-failures, based on mission requirements, maintenance and complexity.

Looking into 1957, he hopes "direct action or further education" will bring more improvements. Looking backwards, he cites several important advances made during 1956:

• There has been a major reliability improvement in microwave power tubes. ARINC (Aeronautical Radio Inc.) reveals one manufacturer was able to increase meantime-to-failure of a magnetron from 45 hours to over 500 hours—through improved design and processing.

• Progress has been made in quality and reliability of electron tubes and components, especially by Signal Corps, where failure rate is now included as a specification on some new parts.

• One airborne digital computer, containing 3,000 electron tubes, 5,000 crystal diodes and 96 transistors operated 450 hours with but four failures. Only one affected flight availability. Reason for reliability: careful equipment design.

• When production of Navy airborne navigation gear was held up because of unsatisfactory service tests, which indicated nine design problems, controlled tests were conducted in the laboratory. After four months and 50,000 set-operating hours, 22 design changes, not nine, were indicated.

• Feedback of failure data from production line to the engineering department on an Air Force airborne fire-control system now in quantity production resulted in increasing meantime-to-failure from three hours to eighteen.

Landmark in the reliability program will be the forthcoming report by the Advisory Group on Reliability of Electronic Equipment (AGREE) whose main task groups include 37 industry representatives, 96 military.

Bridges says the report will lay down ground rules for: reliability specs, design procedures, reliability tests, pilot production, packaging and shipment, and operational maintenance.

MILITARY electronics

Bell Aircraft's automatic carrier landing system, researched and developed under Army and Navy contracts totaling $3 million, enables all-weather landing without assistance from the pilot. Flight path computer and radar antenna gimbaling system used for demonstration model are built by Reeves.

RCA announces precision radar designed specifically for guided-missile range instrumentation. Representing ten years of research and development, the system is also capable of plotting the performance of satellite, drone and other free-space moving targets.

Signal Corps General E. F. Cook urges design and development engineers to guard against producing spurious electromagnetic emission. Describing the interference problem as impairing the operation of America's defense systems, Cook has recently directed accelerated effort in analysis and control of interference.

CONTRACTS awarded

Sperry sells to Army Signal Supply remote compass transmitters, type S3B controls and amplifiers for use with J-2 slaved-gyro magnetic-compass systems for $224,142.

American Bosch Arma wins a $2½-million contract with Air Materiel Command for MD-9 bomber fire-control systems for B-52, including spare components and parts.

Consolidated Avionics will provide Arma Division of American Bosch Arma with test sets to check out missile-borne computer units prior to installation in inertial navigation

systems of completed missiles. Contract: $\frac{1}{4}$ million.

North American is awarded $1,170,511 by Air Materiel Command for installation and flight test of prototype MH-44B autopilots and MA-3 systems, on the F-100C.

Collins will design, develop, construct, test and furnish models of radio-frequency amplifiers AM-1565 under a $351,090 contract with the Bureau of Ships.

Standard Coil's Kollsman Instrument gets $26 million Air Force contract for production of new astrocompass that automatically tracks celestial bodies and computes aircraft direction.

Lear gets $3,961,850 contract with AMC for automatic flight-control systems, spare parts, special tools and data for Boeing KC-135 jet tanker-transport.

GPL gets two contracts with AMC totaling over $4 million: manufacture of electronic control amplifiers for GPL's AN APN-89 doppler navigation system; and research and development work on advanced airborne navigation systems.

University of Chicago will get $396,650 from ARDC for continuation of research on semiconductors and physical electronics.

Stanford will continue research for ARDC on construction and use of a microwave spectrohcliograph, with an additional $183,000 appropriation.

Federal Television will sell R-361A/GR radio receivers to Rome AF Depot totaling $690,637.

Radio Receptor is contracted by Rome Air AF Depot for radar identification sets, AN/UPX-6, amounting to $143,732.

Roanwell gets a $333,504 contract with Rome AF Depot for headsets, H-70A/AIC.

Goodyear Aircraft sells to Air Materiel Command additional facilities valued at $1,279,496 for production of TM-61B missile-guidance systems.

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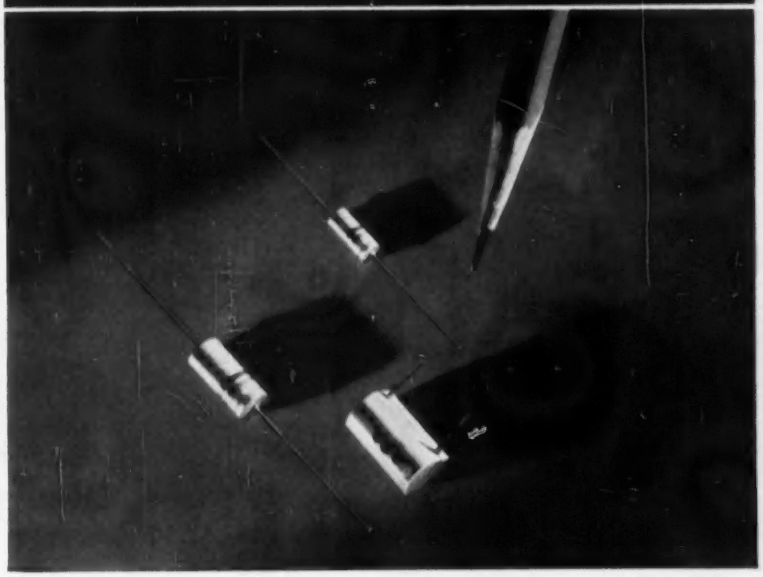

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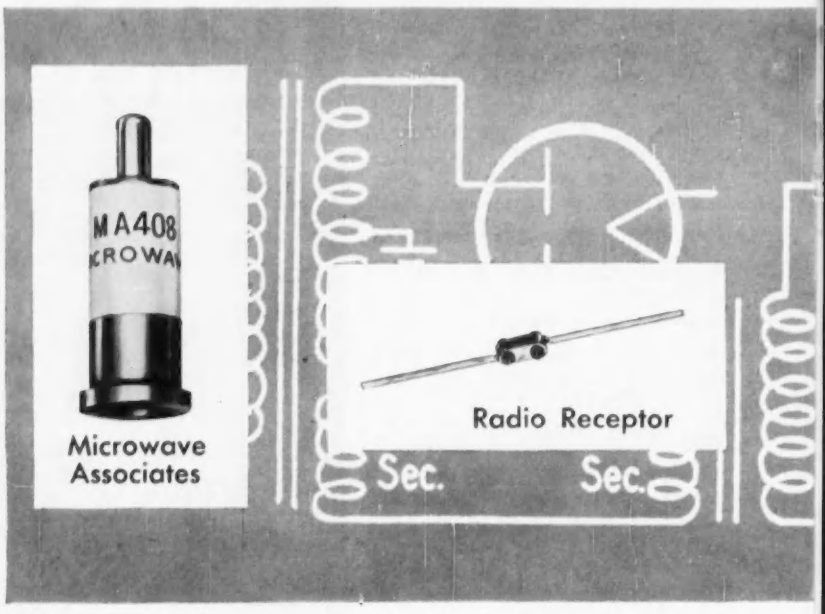
Rectifiers head



MAKING d-c out of a-c, a frequent need in electronic apparatus, is the job of

RECTIFIERS were in use before the discovery of the three-element electron tube. Converting alternating to direct current, however, is still a common need in electronics. **RCA** (P1) announces the 6894 and 6895 half-wave mercury-vapor rectifier tubes for broadcast transmitters and industrial applications.

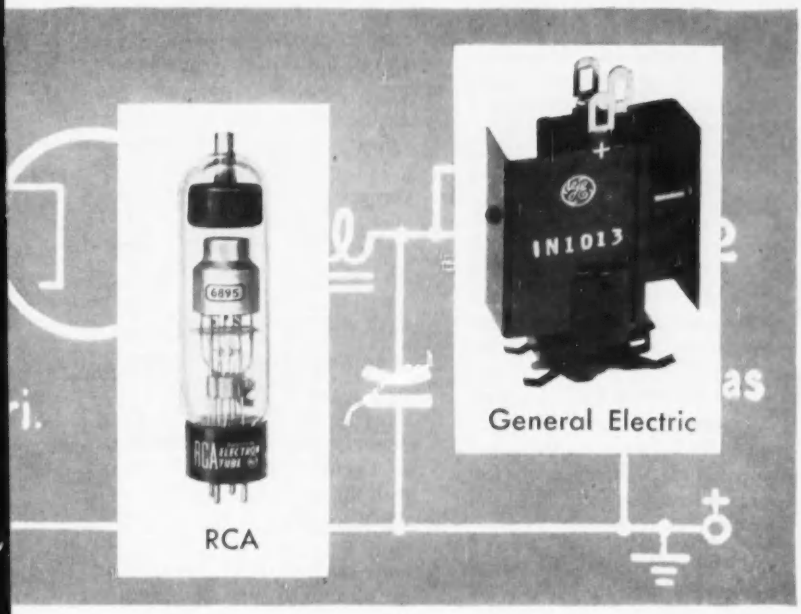
A line of long-life germanium rectifiers to replace other types of rectifiers in black and white television receivers is available from **GE's** (P2) Semiconductor Products Department. **Microwave Associates** (P3) announces a silicon diode for use as a low-level detector in X-band video receiver circuits. **Radio Receptor** (P4) is marketing 5-milliampere half-wave selenium rectifiers made in Germany and said to handle up to 125 volts a-c.

Low temperature coefficients and mechanical stability are claimed for **Johanson Manufacturing's** (P5) sealed trimmer capacitors. . . . **U. S. Components** (P6) announces double-row receptacles with terminations of varied configuration for dip-solder connection to printed-circuit boards. . . . An electronic instrument has been designed by **Allegany Instrument** (P7) to give a digital indication of the time integral of rapidly varying quantities.

Changes in the frequency of microwave oscillators in the S, L, C or X band can be measured with **Laboratory for Electronics'** (P8) microwave stability tester. . . . Three high-speed *pnp* switching transistors (2N315, 2N316 and 2N317) are announced by **General Transistor** (P9) for computer applications. . . . Tape-wound memory cores by **Magnetics, Inc.** (P10) are said to be suitable for use in shift registers, coincident-current matrixes, core-diode mem-

For more information contact manufacturers listed p 36 or circle numbers on READER SERVICE CARD (facing back cover)

NEW PRODUCTS



rectifiers and detectors such as these

ory systems and harmonic generators.

Oscillograph recorders available from **Midwestern Instruments** (P11) have recording speeds from 0.5 to 80 inches per second. . . . A line of high-frequency generators and air presses for electronic heat sealing of flexible and sheet plastics is announced by **Electronic Processes** (P12).

A series of subminiature hermetically sealed relays is available from **Ace Relay Associates** (P13) for radar systems, missiles and computers. . . . Test potentials of 30,000 volts a-c are provided by **Associated Research's** (P14) high-potential tester. . . . A line of plug-in printed-circuit miniature transformers available from **Microtran** (P15) in a wide range of electrical ratings is said to meet the requirements of MIL-27A, Grades 2 and 5.

Alpha Metals' (P16) high-creep strength alloy is said to be suitable for soldering flanges to the barrels of waveguides. . . . A portable automatic electroplating unit offered by **Sel-Rex** (P17) has been designed specifically for electrical and precision components. . . . **Sage** (P18) announces silicone-coated miniature resistors with radial leads and having power ratings of 3, 5, 7 and 10 watts.

A photocell by **Hupp Electronics** (P19) is said to have sufficient power to operate a-c and d-c relays and to operate electronic trigger circuits at 1,000 counts per second. . . . **Optron** (P20) announces an optical displacement measuring device for measuring amplitude, frequency and waveform of shake tables, vibration pickups, accelerometers and relay contacts.

Designed to eliminate layout and drilling of templates for printed circuits, **Wales-Strippit's** (P21) Dupl-O-Scope allows the operator to sight-in on a master circuit to punch a corresponding master template. . . . Plug-in computer packages are available from **Engineered Electronics** (P22) in such forms as flip-flops, delay units, pulse mixer amplifiers and neon drivers.

Frequency meters produced by **American Machine & Foundry**

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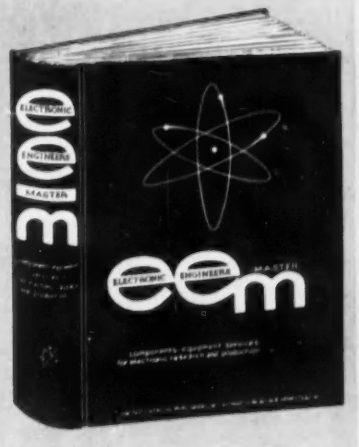

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(P23) operate at frequencies of 50, 60 and 400 cps at a stated accuracy of 0.1 percent. . . . High-gain broadband antennas with 6-ft diameter reflectors developed by **Diamond Antenna and Microwave** (P24) for the K_u band are said to have a beamwidth in both planes of 0.7 ±0.1 degrees.

To measure vibration and shock, **Endevco** (P25) offers an accelerometer which fits a ⅜-inch hole and measures up to 10,000 cps. . . . Two vibration analyzers announced by **Instrument Research & Development** (P26) make possible portable and in-place balancing of rotating parts and assemblies. . . . **American Microwave** (P27) announces microwave relay systems for common carrier, television and data transmission featuring interchangeable r-f components.

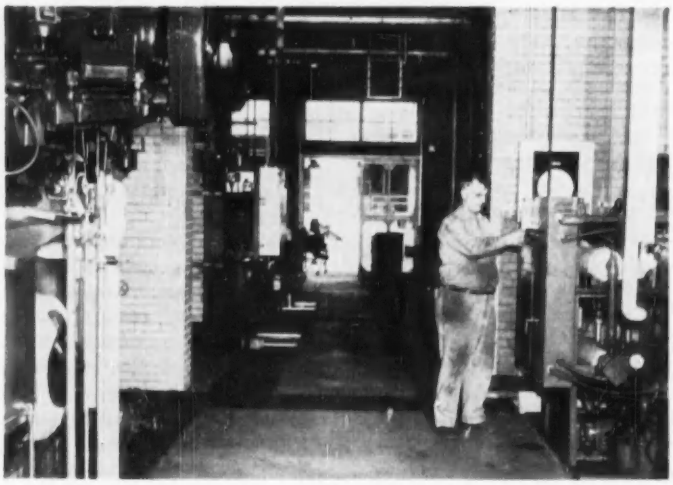
Available with center frequencies of 2,900 mc to 10,000 mc, **Canoga's** (P28) waveguide-to-coaxial adapters for radar provide a d-c return for crystal currents. . . . **Maurey's** (P29) ½-inch trimmer potentiometer has been designed for extreme conditions of heat, humidity, shock and vibration. . . . Pneumatic-electronic level controllers are now available from **Robertshaw-Fulton Controls** (P30) in explosion-proof models.

Ratio meters offered by **Allegany Instrument** (P31) may be used where voltage or resistance ratios are more important than absolute values. . . . **Sola** (P32) announces a 28-volt d-c power supply furnishing up to 50 amps which fits a standard 19-inch rack. . . . Rosin-core solder developed by **Federated Metals** (P33) is said to have outstanding noncorrosive characteristics and minimum odor.

The 17BZP4, a 110-degree rectangular tv picture tube, is offered by **RCA** (P34). . . . Digital flow totalizers have been developed by **Fischer & Porter** (P35) for use with turbine flowmeters and similar signal sources. . . . **Raytheon** (P36) announces an encapsulated plate and filament transformer wound on a toroidal core and featuring a low external magnetic field.

Two miniaturized beam power pentodes, the 6DB5 and 12DB5, offered by **CBS-Hytron** (P37) can be used as vertical deflection amplifiers with 110-degree tv picture

Hot as the HINGES



THREE-TUBE combustion control panel by Electronics Corporation of America is shown at an industrial installation. It allows programmed firing of oil and gas burners. Scanner monitors flame and fuel supply is automatically shut off when flames goes out

tubes. . . . Gear blanks of stainless steel, aluminum, nylon and linen phenolic are available from **PIC Design** (P38) for nonstandard gears, ratchets, sector gears, cams. . . . Rate of pressure changes is measured directly with a transducer system made by **Kistler Instrument** (P39).

An oscilloscope for use as an output indicator with analog computers or characteristic-curve generators is available from **American Electronic Labs** (P40). . . . **DeJUR-Amsco** (P41) announces right-angle pin and socket printed-circuit connectors. . . . An electronic instrument is being produced by **Boonton Radio** (P42) for measuring such plating and film thicknesses as anodic films, paints, chromium and porcelain.

Transistorized digital computers offered by **Autonetics** (P43) weigh about 200 lbs and are said to add, subtract, multiply and divide many times faster than desk calculators. . . . An electronic instrument has been designed by **Lindly & Co.** (P44) for inspecting, counting and providing quantitative analysis of yarn defects in spinning, winding and twisting operations.

Guided missile beacons for operation in S and L bands are announced by **Telerad** (P45). . . . Available with standard a-c and d-c scales, **Burton-Rogers** (P46) panel meters feature clear polystyrene cases. . . . A maximum torque of 0.11 ounce-inch is required with **Electro-Mec's** (P47) type 11 potentiometers for computers.

Linearity of better than 0.5 percent of full bandwidth over full input range is claimed for **Dorsett Lab's** (P48) subcarrier telemetering oscillator. . . . **Beckman** (P49) offers a size 18 servomotor-rate generator designed to operate from a 115-volt, 60-cycle source. . . . Building-block type metal cabinets are offered by **Elgin Metalformers** (P50) for housing instrumentation, electronic and electromechanical equipment.

Power supplies furnishing variable d-c output at up to 15 amps are offered by **Deltron** (P51) for

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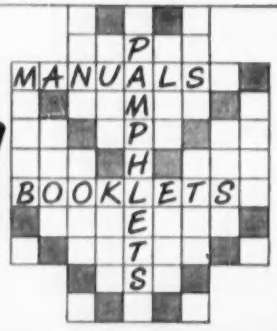

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laboratory use. . . . Aluminum-foil electrolytic capacitors are offered by **Cornell-Dubilier** (P52) for transistorized and printed circuits. . . . Fast-switching silicon diodes produced by **Transitron** (P53) are claimed to have recovery times less than 0.3 microsecond.

Nitrogen cryostats, which can cool infrared detectors to about −196 C, have been developed by **Perkin-Elmer** (P54). . . . Two separate voltage outputs are furnished in **DeJUR-Amsco's** (P55) sine-cosine function potentiometer for analog computer applications. . . . Magnetic-memory planes for digital computing circuits are offered by **General Ceramics** (P56).

New Product Makers

P 1: RCA Tube Div., Harrison, N. J.
P 2: GE Semiconductor Products Dept., Electronics Park, Syracuse, N. Y.
P 3: Microwave Associates, 22 Cummington St., Boston, 15, Mass.
P 4: Radio Receptor, 251 W. 19 St., N.Y. 11, N.Y.
P 5: Johanson Mfg., Box 329, Boonton, N. J.
P 6: U. S. Components, 454 E. 148 St., N. Y. 55, N. Y.
P 7: Allegany Instrument, 1091 Wills Mt., Cumberland, Md.
P 8: Laboratory for Electronics, 75 Pitts St., Boston 14, Mass.
P 9: General Transistor, 91-27 138 Place, Jamaica, N. Y.
P10: Magnetics, Inc., P. O. Box 391, Butler, Pa.
P11: Midwestern Instruments, Tulsa, Okla.
P12: Electronic Processes, 2799 Folsom St., San Francisco 10, Calif.
P13: Ace Relay, 193 Dover St., Somerville, Mass.
P14: Associated Research, 3758 N. Belmont Ave., Chicago 18, Ill.
P15: Microtran, 145 E. Mineola Ave., Valley Stream, N. Y.
P16: Alpha Metals, 56 Water St., Jersey City, N. J.
P17: Sel-Rex, 155 Manchester Pl., Newark 4, N. J.
P18: Sage, 502 N. Goodman St., Rochester, N. Y.
P19: Hupp Electronics, 743 Circle Ave., Forest Park, Ill.
P20: Optron, 5526 State St., Santa Barbara, Calif.
P21: Wales-Strippit, 345 Payne Ave., N. Tonawanda, N. Y.
P22: Engineered Electronics, 506 E. 1st St., Santa Ana, Calif.
P23: American Machine & Foundry, 261 Madison Ave., N. Y. 16, N. Y.
P24: Diamond Antenna & Microwave, 7 N. Ave., Wakefield, Mass.
P25: Endevco Corp., 161 E. Calif. St., Pasadena, Calif.
P26: Instrument Research & Development, 797 Thomas Lane, Columbus, Ohio
P27: American Microwave, 11754 Vose St., N. Hollywood, Calif.
P28: Canoga Corp., 5955 Sepulveda Blvd., Van Nuys, Calif.
P29: Maurey Instrument, 7924 S. Exchange Ave., Chicago 17, Ill.
P30: Robertshaw-Fulton Controls, 2920 N. 4 St., Phila. 33, Pa.
P31: Allegany Instrument, 1091 Wills Mt., Cumberland, Md.
P32: Sola Electric, Chicago, Ill.
P33: Federated Metals, 120 Bway., N. Y. 5, N. Y.
P34: RCA Tube Div., Harrison, N. J.
P35: Fischer & Porter, 952 Jacksonville Rd., Hatboro, Pa.
P36: Raytheon, 100 River St., Waltham 54, Mass.
P37: CBS-Hytron, Danvers, Mass.
P38: PIC Design, 477 Atlantic Ave., East Rockaway, N. Y.
P39: Kistler Instrument, 15 Webster St., N. Tonawanda, N. Y.
P40: American Electronic Labs., 121 N. 7 St., Phila. 6, Pa.
P41: DeJUR-Amsco, 45-01 Northern Blvd., Long Island City 1, N. Y.
P42: Boonton Radio, Boonton, N. J.
P43: Autonetics, 9150 E. Imperial Highway, Downey, Calif.
P44: Libbey & Co., Mineola, N. Y.
P45: Teleral Mfg., 1440 Bwy., N. Y. 18, N. Y.
P46: Burton-Rogers, Cambridge 42, Mass.
P47: Electro-Mec Lab., 47-51 33 St., Long Island City, N. Y.
P48: Dorsett Labs., 401 E. Boyd St., Norman, Okla.
P49: Beckman Helipot Corp., Newport Beach, Calif.
P50: Elgin Metalformers, 901 N. Liberty St., Elgin, Ill.
P51: Deltron, Inc., P. O. Box 192, Glenside, Pa.
P52: Cornell-Dubilier, South Plainfield, N. J.
P53: Transitron, 186 Granite St., Manchester, N. H.
P54: Perkin-Elmer, Main Ave., Norwalk, Conn.
P55: DeJUR-Amsco, 45-01 Northern Blvd., Long Island City 1, N. Y.
P56: General Ceramics, Keasbey, N. J.

TASO gets to work

Industry answers FCC call

Five panels established

Seek new members

TASO is ready to begin work. Last month charter members of the Television Allocations Study Organization were named.

Last September the FCC asked five organizations in the television industry to conduct a study of the technical aspects of vhf and uhf tv broadcasting.

They were RETMA, NARTB, Association of Maximum Service Telecasters, Committee for Competitive Television and the Joint Committee on Educational Television.

Under the executive directorship of George R. Town five technical panels have been set up:

- Transmitting Equipment Panel will appraise performance of tv transmitters, antennas and other transmitting equipment.
- Receiving Equipment Panel will appraise performance of tv receivers.
- Field Tests Panel will measure the performance of present-day and advanced-design receivers.
- Propagation Panel will provide information on vhf and uhf propagation.
- Analysis and Theory Panel will prepare propagation curves, analyze engineering and technical factors having influence on tv picture quality to establish standards of acceptable service.

A report will be made by TASO incorporating the individual panel findings. This will go to the FCC as an advisory opinion.

Town asks that anyone interested in TASO's objectives, regardless of his company's affiliation with one of the five organizations, or lack of it, come forward. "The only qualifications for membership," says Town, "are technical competence, plus the desire and time to serve on the panels."

FCC actions

Sets up registration points for first-class radiotelephone operators. License holders are being prompted to sign up at their local State Employment Service office. This is to give broadcasters a ready pool of operators to draw on.

Underscores Congressional moves to raise broadcasting license periods from three to five years. Some Congressmen are asking for licenses to be permanent.

Stops issuing special temporary authority (sta) to tv stations to begin commercial operation without first completing construction according to the terms of their c-p. Commission feeling is that equipment shortages no longer exist.

Considers answers from 83 uhf stations explaining why they have not gone on the air. Five were given extensions to finish construction. Five construction permits were canceled. Other replies are being studied by the Commission.

Makes Elmira, N. Y. an all uhf city by substituting channel 30 for channel 9.

Adds another vhf channel to St. Louis, Mo., giving that city its fourth commercial channel.

Cancels channel 8 in Peoria, Ill. Getting channels 25 and 31 instead makes Peoria an all uhf city.

STATION moves and plans

WABL, Amite, La., plans power increase from 500 to 1,000 watts.

WMGM, New York, N. Y., changes corporate name from Loew's Inc. to WMGM Broadcasting. A Loew's subsidiary, it's still in the family.

KNEW, Spokane, Wash., is sold to Mount Rainier Radio & Tv Broadcasting by Scripps League Newspapers, Burl Hagadone and Harry Henke, Jr.; $422,648 was the price.

WCTC, New Brunswick, N. J., is being sold by Chanticleer Broadcasting. Price to buyers, a group headed by Joseph Rosemiller and Peter Bordes, $215,000.

WABC-TV, New York, N. Y., sets up sales development and research department.

KOWB, Laramie, Wyo., is being bought by Richard McKee from

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John Alexander and George Dent for $75,000.

WHIL, Medford, Mass., increases power from 1 to 5 kw.

KBYE, Oklahoma City, Okla., is being sold for $90,000. Seller, State Broadcasting. Buyer, Great Empire Telecasting.

KLYR, Clarksville, Ark., is sold by Peach County Radio to Clarksville Radio for $15,436.

WPTX, Lexington Park, Md., changes hands. James Beattie and Arthur Snowberger pay $14,500 to Patuxent Radio.

WACR, Columbus, Miss., goes for $60,000. James Eatherton buys from J. W. Furr.

KTAT, Frederick, Okla., is sold to Ronald W. Wheeler, Jr. for $11,353 by Frederick Broadcasting.

WBRE-TV, Wilkes-Barre, Pa., begins 6 hours a week of local colorcasting, as well as picking up network color.

WTVH, Peoria, Ill., will expand facilities. It plans to spend around $100,000.

KDKA-TV, Pittsburgh, Pa., will affiliate with CBS network.

WDSP, DeFuniak Springs, Fla.; WMAF, Madison, Fla.; WDON, DuQuoin, Ill.; KLOH, Pipestone, Minn.; KLAD, Klamath Falls, Ore.; KLLL, Lubbock, Tex.; WYSR, Franklin, Va.; WDDY, Gloucester, Va. are new affiliates of Keystone Broadcasting System.

WHIE, Griffin, Ga., was sold to Telerad, Inc. for $100,000.

WKNK, Muskegon, Mich., was sold for $150,000. Buyer was Muskegon Broadcasting. Seller, Nicholas and Gladys Kuris.

KLBS, Houston, Tex., is being sold for $525,000 to McLendon Investment by Howard Davis. McLendon already owns four Texas stations.

SUN pulls engineers

Climate sparks Florida growth

Plants find recruiting relatively easy

Tax situation favorable

COMPUTERS, radio and television sets, instruments and controls, radar and communication equipment, servomechanisms and inertial-guidance systems are now homegrown Florida products.

Florida is in the midst of an electronics boom which started in 1953. Sperry Rand's tube division and Radiation Inc. came then. Florida now has more than 80 electronic plants, employing 2,500 and making products with an annual value of $10 million.

This year many more electronics companies are expected to move to Florida. Many of those already there are planning expansion. By year's end the total value of product and the total number of electronics employees are expected to double.

By far the most important factor in winning electronics industry to Florida is the state's ability to attract engineers and skilled labor. This statement is made over and over again by companies that have moved to the area, state authorities and independent experts.

Companies advertising for engineers to work in Florida report considerable success. Radiation Inc., at Melbourne and Orlando, recently expanded its engineering force from 106 to 133 in sixty days. It got 20 applicants for each position offered.

But this is not the whole story. Florida and neighboring states provide a primary military market for electronic products. Sperry Rand and Electronic Communications (formerly Air Associates) which recently announced new Florida plant plans both stress the room available for growth in Florida. Sperry Rand also stresses the value of a climate suitable for outdoor testing.

Florida's favorable labor climate and low taxes are playing a part in all of its industrial growth, points out Arthur D. Little. This consulting firm made a major study of the Florida economy in 1956.

Tax receipts from business and industry represent only 10.9 percent of the entire state tax levy compared with 23 percent for the nation as a whole. There is no corporate or personal state income taxes and no ad valorem tax.

Videotape aimed at DST

ELEVEN Ampex Videotape Recorders will be operating this Spring.

They will aid in solving the complex situation caused by Daylight Saving Time.

DST, beginning the last Sunday in April, is not practiced everywhere in the nation. Tv stations in areas keeping Standard Time find their programming hours askew.

ABC expects to use three Videotape Recorders in Chicago. They will record programs for rebroadcast to "many other time zones within an hour after their original presentation in the East."

NBC will use the recorders to repeat 7:30-8p-m Eastern Daylight Time music and news shows for central zone Standard Time stations. The latter can then get them at the same time they ordinarily get them in the winter, 6:30-7p-m.

CBS has yet to announce its plans. NBC and ABC have three recorders apiece. CBS has five.

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Air GYROS: $¾ billion

Business to double in 5 years

Devices guide long-range missiles

Specifications get tougher

GUIDED MISSILES have created a new breed of miniaturized gyroscopes and with it a giant business. U.S. Time's director of instrument research, Sheldon M. Waldow, estimates $¾ billion was spent last year for research, development and production of missile and aircraft gyros. Bulk of this went for missiles.

"During the next five years," Waldow believes, "production will more than double due to increased missile production."

Size and shape of the gyro business has changed along with the product. Design and production techniques are revised. Established gyro producers are expanding. Manufacturers of unrelated products are entering the field.

New design problems are continual. Air Force used to buy the same gyro for eight or more aircraft types. One design spawned large continued production. Now each missile, though using some gyros in common with others, usually has unique gyro problems.

Miniaturization with improved performance and reliability is main specification for the missile gyro. Missiles create shocks up to 150 g. Life requirements are high. Even though missile may last less than five minutes after firing, testing prior to firing may push gyro's life specifications to—as in the case of Navaho—1,000 hours.

Another problem that complicates missile gyro design is practical producibility. Performance requirements can be realized in design but the design is not always producible. "Simplicity must be built into the gyro for reliability and producibility," Waldow says.

In gyro design and production many engineers are used. Intensive training for technical personnel is necessary. An assembler needs from 8 months to 2 years training. One labor saving factor: electronic test equipment is enabling relatively unskilled personnel to perform an increasing number of precision tasks.

Prices of gyros range from $750 to $10,000 each, depending on whether the order is for prototype or production quantities and on precision requirements.

One gyro firm is now engaged in 15 different missile programs, producing 20 percent more gyros today than seven years ago.

IGNITRONS gross $3 million

IGNITRON TUBES grossed $3 million in 1956. Auxiliary rectifying equipment sales amounted to several times more.

The ignitron is essentially a mercury-type rectifier supplying direct current of from 200 to 900 amperes. Sealed-off ignitrons range in price from $75 to $500 and continuously pumped tubes from $1,000 to $9,000. The largest market is the electrochemical industry, where aluminum, magnesium, sodium and chlorine are processed. Other major customers include steel mills and the transportation and mining industries.

Ignitrons also serve as high-power electronic switches where large currents are to be interrupted after a predetermined number of cycles. This application finds its largest market in welding. Automobile plants use thousands of ignitrons and thyratrons for current control in production-line resistance welding.

Westinghouse, GE, Allis-Chalmers, Amperex and National Electronics are typical producers of sealed-off ignitrons. Westinghouse and GE also manufacture continuously pumped ignitrons. Allis-Chalmers makes excitrons, which are continuously evacuated and continuously excited tubes similar in principle to European multianode rectifiers.

Calls for EDUCATION aids

LACK OF educational facilities and teacher shortages are serious threats to the supply of qualified engineers as well as to the nation's educational level.

Percentage of college grads in engineering and science has been steadily sinking. In 1950 they made up 25 percent. In 1954 the percentage dipped to 18. Forecast for 1960 is 15.

GE's George L. Haller, Defense Electronics Division general manager, recommends tackling the whole educational problem first. In a speech delivered at the Mohawk Valley Engineers banquet, he seconds educators' interest in tv as a solution. But he asks for additional electronic devices.

- "These can range from clerical computers and self-help or problem-solving equipment to a student-teacher feedback communication system.
- "One . . . instructional activity that consumes a great amount of a teacher's time is the preparation, administration, and grading of examinations. Here is a field where machines could take over . . . particularly in the grading.
- "Possible classroom applications of computers for both teachers and students should be thoroughly investigated."

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SWEDEN passes $60 million

Military bootstraps help
Automation is encouraged
Tv broadcasts to begin in '57

SWEDEN's electronics industry is a small $60 million. But it's growing fast. A 20-percent increase each year for the next 10 years is forecast, due mainly to rising military needs.

A military plan earmarks $120 million up to 1965 for procurement of "new types of weapons" and calls for guided-missile units to be part of the air force.

While missiles are being pushed, equal efforts are aimed at building up an electronic countermeasures network capable of jamming all frequencies. One objective: jamming equipment powerful enough to be effective across the Baltic Sea, where Soviet Russia reportedly has at least twenty-one guided-missile launching bases.

Accent on military electronics means the government takes about 75 percent of electronics production in the nonconsumer portion of the industry.

One of Sweden's most promising nonmilitary fields is electronic telephone switching. The giant L. M. Ericsson group has some systems in use.

Electronic computers are receiving wide attention too, with Alwac Aktiebolaget scheduled to get into production this year. Alwac will be tied on the research side to her sister company, Alwac Corp. of Redondo Beach, Calif.

The government is favorable to investment that will push automation. Alwac expects to turn to data-processing systems for programming machine tools.

Several large industrial machinery manufacturers have departments or divisions working in electronics, particularly control systems. These include Asea Electric Co. and Arenco.

Consumer radio-tv production amounts to some $13-15 million a year. Radio sales are steady at 200,000 sets a year—in a country which has only 7 million people. Television is the big growth factor in the consumer sector in the years ahead with regular broadcasting expected to start this year.

Developments ABROAD

In Britain, new Royal Navy position-finding system enables ground controllers to give pilots a position fix within five seconds. Pilot's position is pinpointed by direction finders and telemetered to control point, where it appears on screen as lines of light superimposed on a map. Controller can give an instant reading.

In Geneva, Switzerland 12-nation European nucleonic research organization CERN will set up its electronics production shop. It will make apparatus for its 600 million electron volt synchrocyclotron to be completed this year, and a 25 billion electron volt proton-synchrotron to be completed in 1960.

In Australia a radio-operated tractor has been demonstrated. Eight-button panel on remote transmitter controls tractor. Operator only starts engine and puts it in gear. Even this operation could be made automatic. Tv supervision of remote-control is another possibility. British Farm Equipment Proprietary Ltd. devised the machine. Electric Control and Engineering provides electronic control equipment.

Scotland holds its first radio-tv exhibition since World War II in Glasgow May 22-June 1. There will be 55 exhibitors, including 27 leading radio-tv manufacturers, as well as tube and component makers.

British Institution of Radio Engineers will convene June 27-July 1 at Cambridge. "Electronics in Automation" is the theme. Thirty papers will be presented at six sessions. One session will be devoted entirely to automation in the electronics industry.

EXPORTS and IMPORTS

France's Atomic Energy Commission buys a Reeves Instrument 400 REAC computer for studies of new uses for atomic energy, part of nationwide reactor-building program.

Montreal's Canadian Marconi Co. reports loss of $176,991 in 1956, compared to 1955 profit of $1,007,065. Four reasons are given: substantial outlay for new tube plant, participation in construction of Radio Valve Co. plant, heavy investment in new product research and development and competitive conditions in such fields as tv receivers and tubes.

Indian Prime Minister Nehru uses new jeep-mounted University Loudspeakers sound system. Hundreds of watts of sound power permit addressing up to 100,000 people over half-mile area.

Poland orders a tv station from Marconi of Britain for $560,000.

Standards are those adopted by USSR: 625 lines, 50 fields with a 8-mc channel width. Station will be in Katowice to reach densely populated mining area of southern Poland.

British geiger counter and tube maker, 20th Century Electronic Ltd. renews licensing agreement with French Compagnie Generale de Telegraphie Sans Fils for five years. Under agreement French firm will use 20th Century's designs and patents; French engineers will be trained and technical information exchanged.

Venezuela is accepting bids up to mid-May for a nationwide microwave communications system. Ministry of Communications called for bids, designating 18 firms by name and inviting others to submit offers on government-prepared specifications.

Greek airports at Athens, Salonika and Araxos, are getting visual omnidirectional ranges (VOR), with installation supervised by U. S. Operations Mission to Greece. Country has only one other VOR, at Heraclion, Crete.

Aden orders two radio transmitters from Marconi of Britain. A 7½-kw transmitter will serve Aden Protectorate and a 5-kw will serve Britain's colony of Aden. Both will be operated by Aden Broadcasting Service starting this summer.

India's government-owned $50-million Bharat Electronics drops its French consultants. Bharat produces almost exclusively for the defense ministry.

Austria's tv industry takes steps to sell more sets in 1957. Setmakers brought out new 17-inch units, slashed prices and discontinued austerity models requiring complicated antennas. One firm dropped a $291 price to $259. Tv-radio-record player combinations are priced around $420. Manufacturers hope expanded broadcast schedules and better reception from new equipment in Vienna will help popularize tv.

Edited by DON FINK

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PLANTS and PEOPLE

COOL POOL keeps tempers down, production up, even in soaring Oklahoma temperatures as . . .

TULSA firm goes country club

PROGRESSIVE personnel relations as practiced by Tulsa manufacturer Midwestern Instruments are keeping workers happy. The Oklahoma firm, in business since 1950, put up a three-story production facility on the outskirts of Tulsa, complete with swimming pool, bowling alleys, pool tables, radio shack for company's hams, and penthouse with bar atop the building. All facilities are available to company employees during daytime leisure and offtime.

With 465 employees in Tulsa—and 250 added by recent acquisition of Magnecord division in Chicago—the firm has cut employee turnover to less than one percent, finds it has no trouble hiring for expansion.

Company hires pinboys for alleys, built tower for hams, subsidized construction of ham transmitting gear, keeps the pool at 80 degrees—matching, with palm-frond background, conditions at Waikiki.

Business MEETINGS

Apr. 27-May 2: Scientific Apparatus Makers Association, Greenbrier, White Sulphur Springs, Va.

May 15-17: RETMA, 33d Annual Convention, Sheraton Hotel, Chicago.

May 26-29: National Association of Electrical Distributors, Shoreham and Sheraton Park Hotels, Washington, D. C.

Teletype regroups

WESTERN Electric subsidiary Teletype Corp. is consolidating midwest operations into a multimillion-dollar center in Skokie, Ill. Three buildings to house manufacturing, research and administration are currently under construction on 105-acre tract.

Manufacturing activities will take up a 500,000-sq ft unit, research 120,000 sq ft, and administration 170,000 sq ft. Teletype now operates at seven locations in Chicago area, will relocate them all in new center.

Parent Western Electric is also planning a $35-million plant for electronic switchgear in Oklahoma City. WE figures new production facility will employ 4,000 people.

Raytheon lab goes west

NEW ENGLAND'S Raytheon Corp. is building a 42,000-sq ft laboratory near the Santa Barbara, Calif., airport. Lab, which will be owned by and leased from Pacific Mutual Life, is going up on a 15-acre site, will house 200 employees after mid-July.

Building plans provide for expanding structure up to six times present floor space.

Du Mont firms up government dept.

IN A thoroughgoing reshuffle aimed at firming up its government operations, DuMont Laboratories has moved several second-line managers up a notch. A government relations department now handles the administration and sales of defense contracts. Heading the new department is former assistant sales manager Nelson Lord. Working with him as general sales manager is Richard A. Horton, also formerly an assistant sales manager. Paul F. Brown, former technical assistant to the manufacturing manager, moves up to assist Lord as contract administration manager.

Donald M. Christie, who was Brown's boss as manufacturing manager, moves in as assistant manager of the government division. His slot is filled by Raymond J. Bell, formerly manager of the government methods section. New chief of government methods is Alan R. Howell, who comes over from the process engineering department.

In the company's receiver division, Robert G. Furlong now occupies the job of marketing manager, responsible for the strengthening of DuMont's distribution channels. Furlong leaves Philco to take the job.

Former tube research director Stanley J. Koch meanwhile takes

over responsibility for both industrial and tv tube operations at DuMont, becoming general manager of combined divisions.

TECHNICIAN checks electron gun as . . .

SC forms tube lab

PUSHING its work in large specialized cathode-ray tubes, Stromberg-Carlson is establishing a developmental facility in San Diego, Calif.

S-C has had luck with tubes like the Charactron, a shaped-beam crt used for computer work. Variations of this tube are used in SAGE and in several computer output devices developed by the company.

The new development facility, said to be the first of its kind on the West Coast, includes a materials lab and a model shop, and is currently housed in the San Diego tube plant where the Charactron is manufactured.

Director of the new set-up is Howard W. Grossbohlin, head of S-C's tube and component engineering department.

New execs at Ampex

NEW GENERAL manager at Ampex is vice president Robert Sackman, formerly manager of the firm's instrumentation division.

Everybody moves up one in the instrumentation division: former marketing manager John Jipp takes over as manager. Eastern sales manager Paul Weber takes over Jipp's job. Weber's opposite number for the western region, Thomas E. Davis, becomes national sales manager for the division. The two regional jobs were dissolved in the move.

Meanwhile, Ampex's video service gets a new director as Detroit engineer Paul O. Frincke moves out to West Coast.

Now going up in Sunnyvale, Calif., is a 40,000-sq ft plant to house home recorder and hi-fi manufacturing facilities of subsidiary Ampex Audio. Plans call for eventual expansion to 250,000 sq ft.

Tucson Instrument organizes

NEW manufacturer of test gear and equipment for missiles and aircraft is Tucson Instrument Corp., now occupying a 10,000-sq ft plant near the Tucson, Ariz., airport.

PRESIDENT is Frank R. Perier, who resigned as vice-president of Technology Instrument, Acton, Mass., to take the helm of the new firm. Louis A. Wilson Jr. moves in as vice president for sales.

Executive MOVES

Banker **Hulbert S. Aldrich** moves onto board of IBM World Trade Corp. Computermaker subsidiary also borrows **Edward F. Ormsby** from its parent, moving him in as director of electronic data-processing.

Jack Krutek, secretary of Chicago component manufacturer Drake Mfg., takes on added duties as sales manager, with new assistant **William Wende.**

Tracerlab has new western division director, moving 36-year-old radiochemist **Abel deHaan Jr.** into the job.

William W. Stifler moves up to vice presidency of Aladdin Industries, Nashville, Tenn., will continue to direct activities of Aladdin Electronics.

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REPS to get ultrasonics

ULTRASONIC gear, now pretty much merchandised by its makers, will soon be handled through representatives and jobbers, says Gulton Industries president Leslie K. Gulton.

"Ultrasonic equipment is now capitalizing on the techniques of mass-production," Gulton says, foreseeing a "network of national dealerships." His own company is known to be seeking instrumentation reps in the Midwest, South Southwest.

Subminiature relays of New York's Filtors Inc. are now handled in the South by Atlanta's **Frank C. Nickerson Co.**

Three new reps for Research Instrument's precision potentiometers are **V. T. Rupp,** Los Angeles; **Jules J. Bressler,** Union City, N. J., **Hawthorne Electronics,** Portland, Ore.

Arlington, Mass., rep firm **Instrument Associates** now handles Servo Corp.'s line of instruments and communications systems.

Admiral Corp. is merchandising its record changers and dot generators through a nationwide network of reps and jobbers.

New rep organization for middle Atlantic states: **Harry Estersohn,** Philadelphia. Estersohn, former products sales manager for Jerrold Electronics, figures on handling audio and related lines.

Four new distributors are handling Brush Electronics' industrial instruments for measuring metal surface roughness and for classifying metals. In upper New York state, **Syracuse Supply Co.** got the nod; for New England, **Metallurgical Products,** Brookline, Mass., and **Reynolds Inc.,** Providence, R. I.; and in Los Angeles, **Frey Industrial Supply Co.**

Avnet Corp., Los Angeles, now distributes Sylvania's complete line of electron tubes.

Arnhold Ceramics' electronics division introduces complete line of Isophon speakers and hi-fi equipment in U.S. Previously, Arnhold handled only tweeters of this European brand.

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Machines now mechanize each major step in production of etched wiring boards for Philco television receivers. Resist printer, automatic etcher, selective dip-solderer, automatic tester and other machines used are described by J. Markus, ELECTRONICS, in April 1 issue.

Use of distributed amplifiers as antenna multicouplers is described by E. Pfund, Jr. of United Geophysical Corp. in our April 1 issue. Push-pull distributed amplifier improves multiple reception from single antenna. It overcomes nonlinear distortion. Multicouplers reduce size of antenna forms for long-distance radio reception.

Bathythermometer that telemeters ocean data is described by Snodgrass and Cawley of University of California in our May 1 issue. A two-unit transistorized system lowered from ship gives plot of temperature against depth.

Nuclear-powered aircraft will require components and materials to withstand high radiation levels and operate reliably. Design of electronic equipment to resist effects of radiation is discussed by H. L. Morgan of Motorola in our May 1 issue. Equipment itself must not become radioactive either.

Ignition properties of auto engine fuels can be studied with technique explained by Weller, Schubring and Fitch of General Motors in our May 1 issue. Distribution counter samples peak cylinder pressure at three-degree intervals throughout 60-degree sector of crank angle.

Color test signal that can be added to any video program is proposed by R. C. Kennedy of NBC in our May 1 issue. It permits adjustment of color receivers during monochrome broadcasts.

THE EDITORS

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P2	P7	P12	P18	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P98
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P99
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

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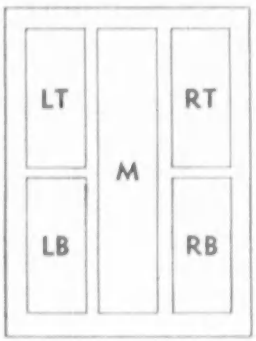
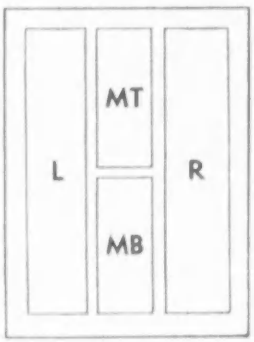
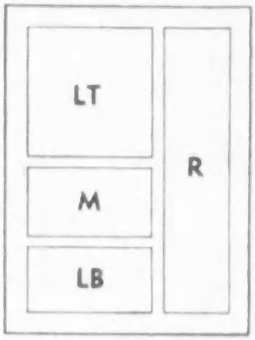
P2	P7	P12	P17	P22	P27	P32	P37	P42	P47	P52	P57	P62	P67	P72	P77	P82	P87	P92	P97
P3	P8	P13	P18	P23	P28	P33	P38	P43	P48	P53	P58	P63	P68	P73	P78	P83	P88	P93	P99
P4	P9	P14	P19	P24	P29	P34	P39	P44	P49	P54	P59	P64	P69	P74	P79	P84	P89	P94	P98
P5	P10	P15	P20	P25	P30	P35	P40	P45	P50	P55	P60	P65	P70	P75	P80	P85	P90	P95	P100

DIAGRAMS BELOW SHOW HOW TO USE THE KEY
ON PAGES WITH MORE THAN ONE ADVERTISEMENT







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USE THIS KEY:

R—Right

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L—Left

LT—Left Top

LB—Left Bottom

M—Middle

MT—Middle Top

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